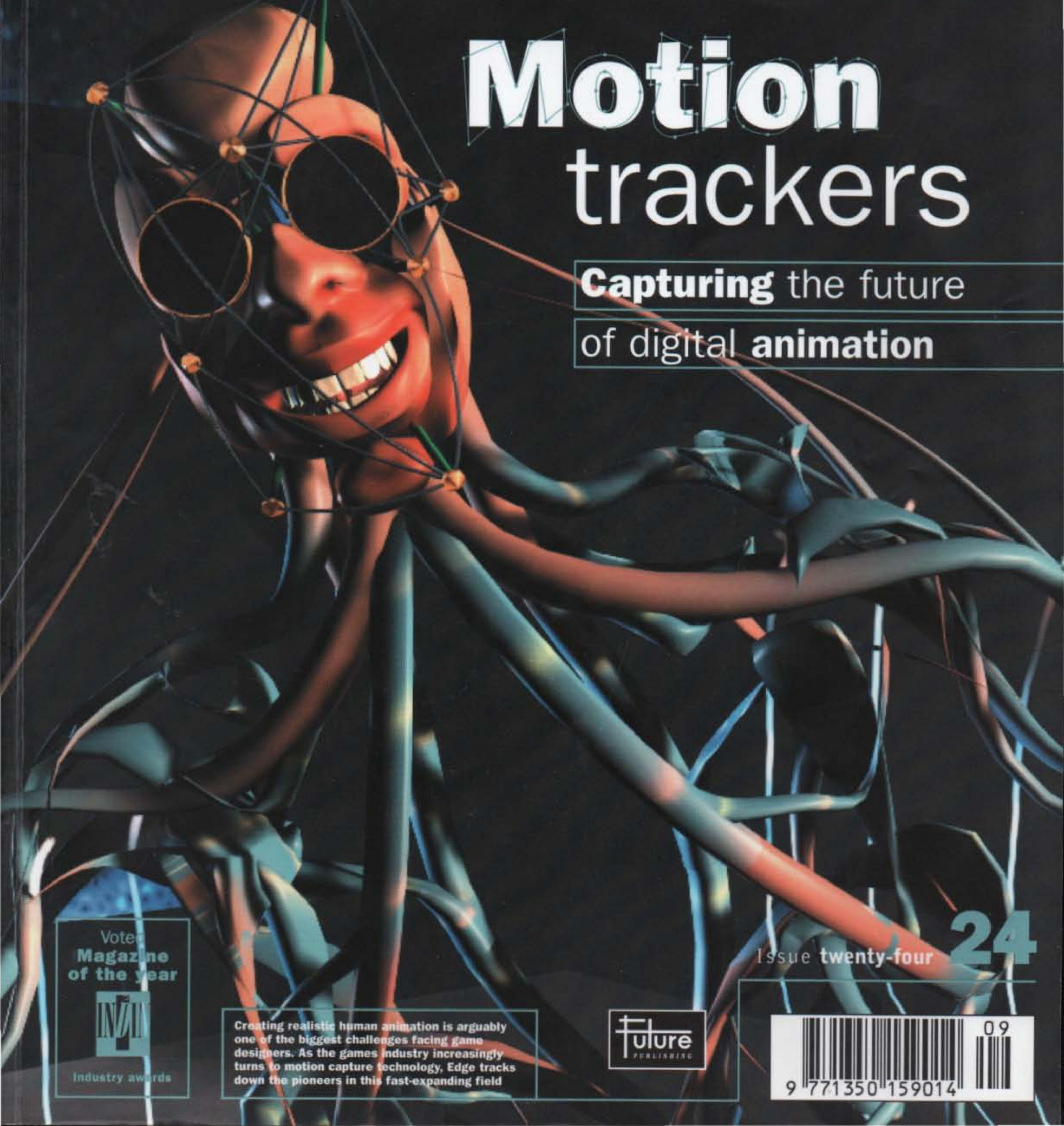
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EDGE

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Motion trackers

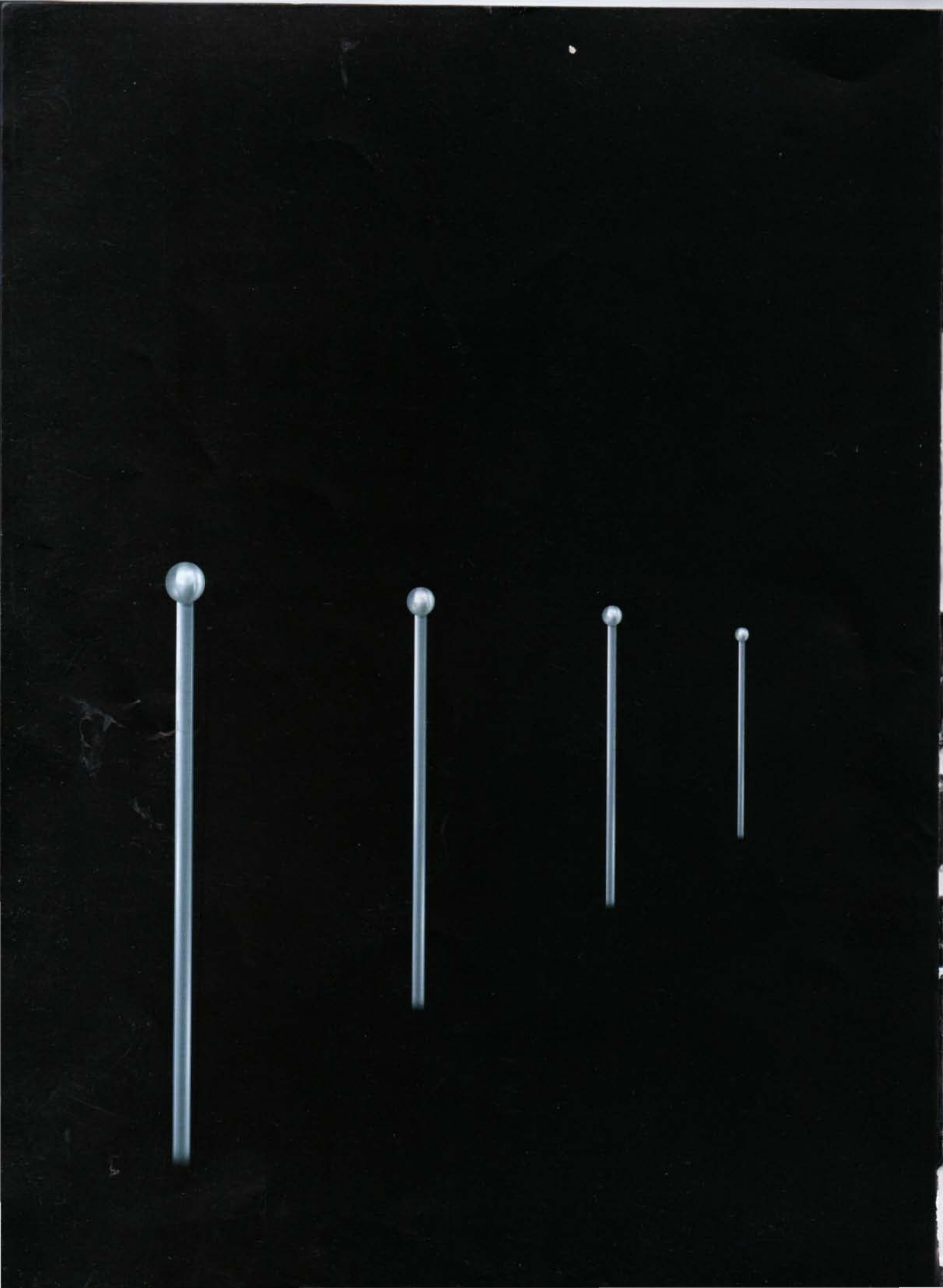
Capturing the future of digital **animation**

Issue **twenty-four** 24

Voted **Magazine of the year** Industry awards

Creating realistic human animation is arguably one of the biggest challenges facing game designers. As the games industry increasingly turns to motion capture technology, Edge tracks down the pioneers in this fast-expanding field

Future Publishing





The Miyamoto touch: Nintendo's trump card

Paradoxically, it's beginning to look as if Nintendo's stubborn commitment to 16bit gaming could prove to be a winning hand. The company's new *Super Mario World* sequel, *Yoshi's Island*, could easily turn out to be one of the best games of the year and in the process provide the catalyst for an upsurge in the fortunes of the languishing SNES market.

The most significant thing about *Yoshi's Island* is how long it has taken Nintendo to get around to releasing a follow-up to its flagship 1990 SFC game. Whereas other companies are content to hack out sequels with little thought for progression or innovation, Nintendo is different. And for that we've got Shigeru Miyamoto to thank. Instead of compromising game design for the sake of tight production schedules or marketing agendas, NCL's games genius takes as much time as a game needs. And if that means leaving gaping holes in a release schedule, so be it (as Nintendo's recent period of dormancy attests).

This commitment to gameplay above all else is something that, on the evidence so far, is unique to Nintendo. The shallowness of most 32bit releases shows how game design has become subordinate to the 'production values' which consume most of a game's resources. Witness the myriad CD-ROM titles which fall at this all-too-obvious hurdle.

If Nintendo can continue to create the world's best gameplay on a 16bit console, potential 32bit adopters might do well to look before they leap.

The **future** is almost here…

inside

EDGE

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Eadweard Muybridge photographs courtesy of the **Royal Photographic Society**

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Virtual Boy (left), Saturn (top) and Bandai's Power Player

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Tilt (left) and Tekken 2

66 Testscreen

Ace Combat (left) and Terminal Velocity





90 Hiroshi Imanishi



Photography: Antonio Pagnotta da Fonseca

Cutting Edge

The latest **news** from the world of interactive entertainment

3DO buoyant as **M2** picks up speed

3DO is confident that next year's launch of M2 will put it back on top

The progress of 3DO – from pipe dream to would-be global standard to just another 32bit console – has taken an upswing in the US recently. 3DO manufacturers Panasonic and Goldstar have cut the retail price of their machines to $299, giving them a $100 advantage over Sega's newly launched Saturn. Not surprisingly, 3DO is now claiming that it is outselling Sega by a ratio of at least four to one.

Nevertheless, 3DO's lack of quality software releases in recent months has become an area of great concern and has led many people to turn their attention to M2 – the company's second-generation machine, which is possibly due for release in early 1996. 3DO proudly boasts that M2 is significantly more powerful than the Saturn, PlayStation, Nintendo Ultra 64 and even Sega's super-high-spec Model 2 arcade board.

Given that the 3DO Mk 1 hardware wasn't finished until just a few months before the unit went on sale, M2 appears to be progressing well. A 3DO insider told **Edge**: 'Work on the operating system is going faster than we expected, although a shortage of silicon coming out of IBM has slowed things up slightly.' Consequently, the number of functioning M2 development systems is severely limited, and only a few select companies have received kit that are even approaching final



According to 3DO, Studio 3DO's *M2 Racing* (working title) will feature graphics of this quality (although the game is now Formula One-based)

specification. However, 3DO is stressing to developers that more equipment is due to ship soon.

The development system's CPU is currently running at around 50MHz rather than the intended 66MHz, and there are a few other small discrepancies yet to iron out, but the system's staggering performance is apparently already evident. According to **Edge**'s source, 'Even with early silicon and with a version of the operating system that has yet to be optimised, we are already seeing 3D models composed of 450,000 textured and lit →

Ultra 64 update

Ultra 64 rumours continue to fly around the development community. At the time of writing, no NU64 silicon had been shipped to thirdparty developers – except Rare, where progress is believed to be good but slower than expected.

According to some sources, other Dream Team companies have been hamstrung by the fact that their Onyx RealityEngine-based software produces code that is only 60 per cent compatible with the finished hardware.





Left: the first M2 silicon includes (left to right) the graphics ASIC, the PowerPC 602 and a CD controller chip. Goldstar has produced this M2 mock-up (above)

Neo-Geo CD takes on US

After selling around 300,000 units in Japan and making inroads into the UK market, SNK is launching its Neo-Geo CD console in the US. The machine will retail at $399 and will contain a double-speed CD-ROM drive, halving the horrendous loading times that Japanese and UK owners have had to put up with on high-memory games.

SNK claims that 70 CD games will be available at launch, including 20 new titles. But despite the Neo-Geo's long-standing arcade and home success, it's doubtful that its huge library of sprite-based beat 'em ups will be enough to secure the machine more than a niche market outside Japan.

→ polygons running at 30 frames per second. It's incredible.'

Not surprisingly, M2 will adhere to the same production philosophy as the first machine – The 3DO Company will develop the format and thirdparty manufacturers will produce and market the hardware. It's still not clear if all licensed 3DO Mk1 manufacturers are committed to manufacturing M2 machines (although Goldstar and Matsushita have already produced mock-ups), but the involvement of other big-name companies (such as Philips and even Sega) has been rumoured for months.

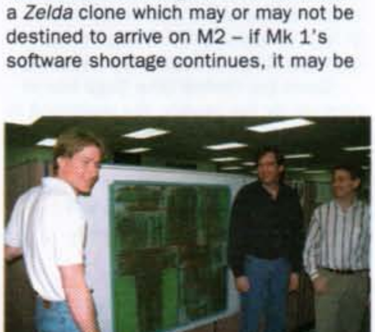
On the software front, **Edge** has learned that at least 15 M2 titles are in development, all scheduled for release around the time of the machine's launch. Unsurprisingly, the most advanced work in development is being undertaken internally at Studio 3DO in San Mateo, California.

Of most interest to potential M2 owners is a game with the working title *M2 Racing*. This is thought to be a Formula One racer designed by the same team which produced the futuristic racing demo (see **Edge** 23) shown at E³ in May. Other projects include a golf game and (at a much more advanced stage of development) a *Zelda* clone which may or may not be destined to arrive on M2 – if Mk 1's software shortage continues, it may be needed to bolster the current roster of 3DO games.

Electronic Arts – the one software company to have consistently performed on the 3DO – is also developing original M2 games, all of them, predictably, sequels to existing titles. An all-new M2 version of *John Madden* (the '98 edition, in fact) sounds the most promising, given that it was already a superb game. Another title following the route from Mega Drive to 3DO to M2 is *Road Rash*, for which, again, the quality expectations are high. An M2 *NHL Hockey* should also be one of the initial EA titles.

Of the other thirdparty M2 titles uncovered by **Edge**, the most tantalising are Silent Software's *Return Fire II* (a sequel to one of the few 'must have' games on the 3DO), *Top Gun* from Spectrum Holobyte, and a sequel to Interplay's *Descent*.

But perhaps the most promising aspect of 3DO's M2 strategy is its plan to implement an 'arcade business model'. So far, three US companies – Williams Entertainment, Time Warner and Acclaim – are preparing to develop arcade games using the M2 chipset. Williams allegedly has a '*Toshinden* killer' in the works, while Acclaim's *Batman Forever* licence looks a likely prospect for adaptation. 3DO is also in the process of courting Japanese coin-op manufacturers, whose expertise would undeniably add to the format's credibility. **E**





Part of the M2 development team poses next to a schematic of the system's internal architecture (left). Development systems are nearing completion (right)

Who is it?

An aristocrat by name, this man is one of the most successful game designers ever. He has captured the hearts and minds of a generation of silicon explorers, and is now effectively the master of his own genre

M2 launch software

The following games are scheduled to appear in time for the M2 launch (or thereabouts):

• *Descent* (Interplay)
• *Disruptor* – also due on 3DO Mk 1, a *Doom*-style shoot 'em up (Universal Interactive Studios)
***Return Fire II* – featuring a brand-new 3D engine (Silent Software)**
• *Top Gun* – not a PC port but a new version that will apparently make the U64 version 'pale by comparison' (Spectrum Holobyte)
• M2-powered arcade beat 'em up (Williams Entertainment)
***Wing Commander* IV (Origin)**
• *John Madden '98, NHL Hockey, Road Rash*
***Olympic Soccer* (Silicon Dreams)**
• Undecided: Crystal Dynamics, Capcom, Acclaim

Saturn roll-out yields mixed blessings

Sega pre-emptive strike in the US and the UK was not all good news

it is...

Lord British, aka Richard Garriott, creator of the *Ultima* series of adventure games. *Ultima IX*, now being worked on, will feature name actors and mark a return to the party-based system

As predicted in **Edge** 23, Sega launched the Saturn in Europe on 'Saturnday', July 8, two months earlier than expected. Initial UK sales have been promising, with upwards of 5000 units moved in the first week.

The launch was preceded by one-page teaser ads in high-gloss, high-selling mainstream magazines such as *Esquire* and *Arena* (as well as extensive coverage in the tabloids), leaving little doubt about the demographics of Sega's target market: over 18s with credit cards and cash to burn. Given the short run-up time, the company seems to have got the message across very effectively.

Sega is unwilling to divulge exact ship-out figures for Europe, but retail demand certainly outstripped supply. All stock was allocated by Sega after stores had put in their bids and, whether it was due to a genuine PAL Saturn shortage (UK distributor Centregold received just 50 of the 500 machines it had ordered) or clever market manipulation, most shops had to settle for fewer units than they asked for, with the result that they had to turn away customers.



The initial pan-European ship-out was estimated at 30,000, with around 20,000 units making it to the UK. The games available at launch were the original *Virtua Fighter* (bundled with the machine), *Daytona USA*, *Clockwork Knight*, and *International Victory Goal*. Accessories included the redesigned UK pad, a Virtua arcade-style stick, and an RF lead, costing an extra £25. Accessories to be released in the pre-Christmas period include the *Daytona* steering wheel, Photo CD software and an MPEG video card.

Sega will be more than pleased with the performance of both software and hardware in the first week. On the initial weekend, Gallup registered 2000 sales of *Daytona* throughout the country, and *International Victory Goal* was placed at number 12 in the CD-ROM charts. Sega claims that this equates to hardware sales of over 5000 units, and that some companies are selling twice their forecast. Virgin's London Megastore reportedly obtained 60 Saturns and had sold around 50 within the first few days. Another store's manager commented: 'It's going very well. It's the only games console that's selling at the moment.'

The UK Saturn came supplied with a SCART connector only – much to the annoyance of many purchasers, judging by the number of **Edge** readers who have phoned the magazine to complain. Although SOE claims that over 80 per cent of TVs have SCART sockets (rising to the well over 90 per cent in the group likely to buy Saturns), this seemed to be at odds with the number of people having to fork out an extra £25 for RF cables – in fact, demand for RF leads was so high that it led to a temporary shortage.

Given the limited time Sega had to prepare for the launch, it's surprising to see that most of the first UK games run in (almost) full screen. *Daytona USA* fares worst, with its letterbox display made narrower to keep the game running at an acceptable speed.

Across the pond, where Sega rolled out the Saturn on the first day of the vital E³ conference in May, journalists and consumers had to cope →



The all-black PAL Saturn is now available in UK high streets. But will it continue to sell?

SOA rethinks strategy

As Edge went to press, Sega Of America was rumoured to be on the brink of making a major announcement in New York about an alliance with another company. Panasonic, Lockheed Martin and Nvidea are all thought to be likely candidates.

Sega will also be revealing its Saturn software line-up. A change in the company's Christmas schedule is on the cards, which could include the cutting of several key projects. Full details in Edge 25.

Saturn a success?

Edge asked Sega's major rivals to comment on the Saturn launch. All except Sony agreed.

'It's unusually underwhelming. I'd have expected much more from Sega. It was almost even sales between 3DO and Saturn in the launch week. If you have as much hype as Saturn, this first week will be a huge disappointment for Sega. It will fill demand for a couple of weeks and then it will drop like a stone.'
Bob Faber, MD, 3DO Europe

'It's far too early to judge performance of this new format based on one week's sales in the middle of summer during a heat wave and before a major part of the marketing campaign kicks in. I understand that stocks were not exactly plentiful but that Sega had reasonable success.'
Mark Edridge, marketing director, Nintendo UK

'Our feedback from the trade has suggested they received a much reduced quantity but they still held stock, suggesting a less than impressive sell-through. This product seems to have fallen between two stools: too expensive for the top-end toy market and not interactive enough to challenge low-end PCs.'
Darryl Still, marketing manager, Atari UK





The PAL Saturn (right) suffers slightly in comparison to the NTSC model (left). *VF* is virtually fullscreen but squat characters and slower animation are now in evidence

→ with an even more dramatic change of plan (see **Edge** 23). Now the chaotic launch situation can be clarified and firm figures obtained about the Saturn's early performance in what is a crucial territory for Sega.

In the beginning, four prominent North American software chains received copious numbers of Saturn units and empty boxes with which to fill their front windows (a tactic later repeated in the UK). Promotional videotapes flashed images of current and upcoming Saturn games to passers-by, and a handful of easy-to-port, cheapish software (the same as the UK line-up) accompanied the machines onto shelves at launch. Hardware sell-outs were reported in each chain (by Sega), and a free Saturn hotline was set up to provide information on the hardware and news of upcoming software releases – although when **Edge** called it was told that the Saturn was, in fact, a 128bit machine, thanks to its twin CPUs and five co-processors...

After the initial sales frenzy had passed, small game vendors received their allocation of Saturns and accessories. Sega now boasts that it has sold 100,000 units – a suspiciously high number considering the roll-out rush.

And many major US department store chains with enviable purchasing power never received Saturns to sell. One (evidently piqued) chain responded in some locations by boosting the profile of 3DO hardware while reducing the prominence of Sega's Genesis (Mega Drive) displays.

Ironically, Sega's ad expenditure and brand-name status in the US also provided a boost for 3DO. Many American stores reported that the Saturn media blitz had lured people in, only to find Goldstar and Panasonic waiting to pounce. The 3DO now has over a dozen top titles and an attractive $299 recommended retail price. For some, the temptation to buy a $100 cheaper 3DO proved too much.

More worryingly, certain software developers were less than pleased with Sega's early release. Although the Western development community has great difficulty in hitting any deadline, there was a sense in many quarters that Sega had cheated it of a chance to participate in the launch. Companies will now have to rush or re-evaluate projects scheduled for September, but the fact that there will be an installed userbase of sorts when the titles do emerge must be some consolation.

Whatever the longterm consequences are of bringing the Saturn into play early, Sega seems to have won the short-term battle; both the US and UK launches can be regarded as successes. The Saturn is out there and selling better than expected, even at £400. However, it is the machine's ability to attract new devotees with top-notch software over the next six months that will be critical. And with the battle about to intensify, Sega's game creators had better be on their best form.

PAL: spot the difference

Despite Sega efforts to ensure that the PAL Saturn's display was as close to its NTSC counterpart as possible, there are still differences. Instead of letterboxing every game (as was the case with the Mega Drive and SNES), Sega has at least provided fullscreen displays (although there are still tiny borders) on *Virtua Fighter, Panzer Dragoon* and *International Victory Goal.* Letterboxed titles include *Clockwork Knight* and the horribly narrow *Daytona USA* (the Japanese version already had smallish borders).



Taito's *Ray Force* should show off the Saturn's sprite handling abilities







Prospective Saturn owners will be eyeing future titles closely. The next wave of Japanese-originated software includes *Legend Of Thor* (left), *Guardian Heroes* (middle) and, the jewel in Sega's crown, *Virtua Fighter 2* (right)

Power Player: Mac in a box gets a facelift

Development on Bandai's Pippin-licensed console is proceeding apace





The Power Player's redesigned controller features a directional pad and a trackball, plus two shoulder buttons and four thumb buttons arranged in a diamond formation

Bandai has revealed the final shape of its Power Player console – the first machine to subscribe to Apple's Pippin format. The original incarnation of the hardware, shown at the Milia '95 show in Cannes, was less like a console and more like a hi-fi separate (it was also, less flatteringly, reminiscent of the CD-i and CDTV). But by the time the Tokyo Toy Show took place in June it had undergone a complete transformation. With its subtle curves and sleek, grey finish, it now resembles nothing less than a Macintosh console which could have come straight out of Apple's own design studios.

The Power Player represents a brave step into new territory for both Apple and Bandai: not only is it the first fruit of Apple's decision to establish the Pippin licence, which enables thirdparty manufacturers to use a cut-down version of the Mac operating system, but it's also the Japanese toy manufacturer's first serious foray into the hardware sector (its 8bit CD console, Playdia, seems to have died a quiet death on the shelves in Japan).

Edge visited Bandai's offices in Taito-ku, Tokyo, and spoke to **Shin Unozawa**, general manager of the Power Player project, about the company's plans for the hardware.



Shin Unozawa, general manager of Bandai's Power Player project. The company is aiming to provide a multimedia system that can act as both a cut-down Macintosh and a terminal for a custom network



Edge How near is the Power Player hardware to completion?

Shin Unozawa We're still developing it. The first board, EVT-1, is now finished. We haven't decided exactly what we're going to put inside, but we do know that it's not a games machine like the Saturn, Playstation or Ultra 64. We want to produce a new kind of machine using the Apple OS. The Pippin is not even a computer – we want to create a new category. It will use a TV set and have a CD-ROM and a networking device, and these three components make it a new type of hardware.

Edge So what exactly will people be able to do with the Power Player?

SU Naturally, they'll be able to play Apple games, and it will also be possible to use simple word processors and some art packages. It may be possible to do that without a hard disk but, of course, users will prefer to have the hard disk add-on. We also want the Power Player to be a communication machine – we're thinking of including a Geoport. We've had a lot of advice from Japanese and foreign software developers about what could be done with the comms capability of the Power Player. Some of them are thinking about education – students would be able to do their revision and their university tests using the Pippin. [60% of Japanese students revise for their university exams in Juku private schools, making for a huge market.] They will only have to connect their →



The new-look Bandai Power Player, as shown at the Tokyo Toy Show, complete with the original all-grey controller (top). An external hard-disk drive will also be available for the machine (above)

Data stream

Cost of portable CD-i: **£1250**
Cost of CD-i PC card: **$500**
Number of 8bit machines in French homes: **3,440,000**
Number of 16bit machines in French homes: **2,135,000**
Proportion of CD-ROM sales taken by the PC: **80%**
Average cost of developing a game in 1990: **£40,000**
Average cost of developing a game now: **£140,000**
Average time taken for processor power to double: **18 months**
Nintendo's US marketing budget for *Yoshi's Island*: **$7 million**
Marketing budget for *Killer Instinct*: **$20 million**
Marketing budget for *DKC2*: **$10 million**
Marketing budget for Virtual Boy: **$25 million**
Number of electrons required to represent one bit of information in a chip: **500,000**
Annual number of complaints to the Dutch advertising standards authority: **714**
Annual number of complaints to the British ASA: **11,210**
Amount of money spent by US telecommunications firms in lobbying Congress during the last decade: **$40 million**
Amount of money spent by US government on nuclear weapons in the past 50 years: **$4 trillion**
Annual growth in US box office sales: **4%**
Fall in price of coffee during 1994: **40%**
Estimated value of undiscovered pharmaceuticals in tropical rainforests: **$147 billion**
Number of Pot Noodles consumed by the Chinese State Circus during its last British tour: **14,000**





Screens from Franky Online, a PC network service created by Japanese firm Future Pirates. It offers a variety of services from shopping to education

→ Power Player to the TV and they'll be in contact with a teacher. In Japan, this system is already emerging on PC, but with the Power Player it'll be cheaper. We also want to use it as a karaoke machine – consumers will be able to download whatever song they want. Overall, the Power Player could be seen as a 'personal communicator'.

Edge Does that mean there will be a Power player on-line service?

SU We want to create a network service, like the Internet. If we don't do that, users will be able to play only Mac software and it'll be just like a Macintosh. We want to add something new to the Power Player. The company Future Pirates has created a network service called Franky Online for PC users, which is accessed with a CD-ROM and a password. This is now up and running in Japan, and users can shop on-line, send e-mails and do a great many other things. Future Pirates is also developing an on-line service for Pippin users which is going to be cheaper. We also want to simplify the connection and the download system. Phone lines are very slow, and it takes time to download graphics or sounds, so we would like to use a CD-ROM to store them and only download the realtime parameters from the on-line service. Users will be able to connect easily using a password.

Edge What software is being developed for the Power Player?

SU There are 300 Japanese developers participating in the project, and about 130 titles will be available at launch. Around 60 of these will be education software and 40 entertainment software (including games). Bandai will release Power Player versions of games like *Gundam*, *Sailor Moon* and *Dragon Ball*.

Edge Are there any major game developers onboard, such as Konami or Sega?

SU There are around 30 developers. Most of them are PC-oriented, but Namco is working on software.

Edge Could you use high-end Macintosh applications on the Power Player – say, Adobe *Photoshop*?

SU The latest Japanese version of *Photoshop* needs 12Mb of RAM to run, and the Power Player only has 6Mb. But maybe a special version of *Photoshop* could be produced for the Power Player. But it will be possible to add two, four or eight megabytes of extra memory, so the total possible memory is 14 megabytes. As the system software and the screen use around 2Mb, it would therefore be just possible to use *Photoshop*. However, it's not one of our objectives to run *Photoshop* on the Power Player.

Edge How many units are you expecting to sell?

SU There are between 500,000 and 600,000 Macintoshes in Japan and we hope to sell the same number of Power Players in the first year.

Edge And what's the target audience?

SU In Japan, the average age of console users is 12 years old, and for computer users it's 30 years old. Our target is around 20 years old.

Edge What if Apple licenses another Pippin manufacturer?

SU That's no problem. Even if they release an integrated TV and Pippin, that's no problem for us.

'There are 300 Japanese developers participating in the project, and about 130 titles will be available at launch. Around 40 of these will be games'





Bandai is keen to emulate Franky Online for Power Player users



SGI launch

Silicon Graphics has launched its new Indigo² Impact, which it claims is the world's fastest desktop graphics workstation, with three times the 3D performance of the previous world leader, the Indigo² Extreme. The base model retails at £29,000, rising to £49,600 for the high-end Power Indigo² Maximum Impact.

Virtual Boy: first software revealed

Nintendo shows what its new hardware can do. But is it enough?

Now that the US release of the Ultra 64 has been pushed back well into next year, the Virtual Boy has assumed a critical importance for Nintendo. The company now has to convince a loyal Japanese and sceptical North American public that its awkwardly shaped box is more than just a gimmick.

This marketing problem is compounded by the fact that conventional publicity just won't work – blocky red images on 40-foot billboards do not equate to a successful advertising campaign. It's a 'try before you buy' product, and Nintendo knows it. That's why it's going to great lengths to have software ready for launch and to make sure the titles keep flowing. **Edge** takes a look at the early releases that will make or break the system.

Mario's Dream Tennis

Not so much a dream as a standard tennis game with cartoony artwork and a thirdperson perspective, *Mario's Dream Tennis* is neither exceptional nor the best use of the Virtual Boy's 3D technology. The player controls one of the characters from the *Mario* series on a simple scaling 3D court which has a viewpoint not unlike that in Tonkin House's early SNES title, *Super Tennis*. Lacking the dynamic in-play camera movement or large characters which might have made it a star, *Mario's Dream Tennis* looks more like an 8bit game than a 32bit one. But it has somehow become the machine's pack-in title for the US, with Nintendo obviously hoping that the Mario connection will help sales.



Red Alarm

The Virtual Boy's thirdperson blaster combines *Starfox* with *Tempest 2000* to create some of the best vector polygon effects and 3D surrealism in console gaming. Piloting a starfighter through hovering, immersive wireframe worlds, the player eliminates fixed and moving targets with multiple weapons, with audiovisual treats keeping the gameplay exciting. Even acceleration and turning become brief learning experiences with the two-joypad VB controller, helping *Red Alarm* to transcend the 'been there, done that' feeling from the start. The most immersive experience to be had on the Virtual Boy so far.

Mario Clash

Mario Clash places you in a 3D single-screen room reminiscent of the original *Mario Brothers* game, apart from the new perspective – the top platforms are in the distance while the bottom ones are closer to the eye lenses. Picking up where *Mario Brothers* left off, it has Mario grabbing enemies and hurling them at each other, with some token 3D effects here and there. Increased speed adds to the challenge, but the game's longterm depth and value remain in question.

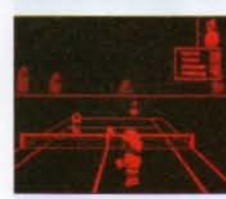
Galactic Pinball

With four standard pinball machines and hidden bonus levels, *Galactic Pinball* is one of the better Virtual Boy titles. It combines fundamentally sound pinball action with shooting bonus scenes and trick-shot elements, and also offers a wide variety of impressive →



Hudson Soft's *Vertical Force* uses the VB's display to create convincing parallax, allowing the player to move between planes





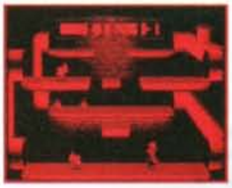
***Mario's Dream Tennis* (above) and 3D blaster *Red Alarm* (top) – one of the titles that makes relatively good use of the Virtual Boy's 3D display. But will consumers regard dismiss VB as simply a 'red Game Boy'?**



Zelda returns

Nintendo's Satellaview system (see Edge 19) is being used to give Japanese gamers access to a reworked version of *Zelda* (above). Owners of the SFC-based satellite technology will be allowed to download and play various stages of the game for one hour between 6pm and 7pm every Sunday for four weeks. After each session, game positions will be saved and when the final hour has elapsed the 50 highest scoring players will each be sent a free memory pack.

The new *Zelda* is based on the game originally released nine years ago on the Famicom disk system. However, there are strong rumours that Shigeru Miyamoto has a new 16bit *Zelda* nearing completion – something that would give SFC owners just cause for celebration.









From top: *Mario Clash* is a 3D variation on the original *Mario Bros*; *Galactic Pinball* has five tables and realistic ball movement; T&E Soft's *VR Golf* should sell well in the US; Hudson's *Panic Bomber* is the token puzzle game

→ 3D effects. Floating objects inside the four machines' tilted-perspective shells create a unique 3D hovering sensation, and the gameplay is fun from the word go.

VR Golf

A variant on the now-standard thirdperson-perspective T&E Soft golf software on Super NES, 3DO and Saturn – which in the past has included Pebble Beach, Augusta and Masters courses – but this time with more 3D land texturing and floating icons. Not especially immersive – and indeed the first game to feature entirely red 'greens' – but a solid golf title nonetheless.

TeleRoboxer

After *Punch-Out!* and its sequel, one might reasonably expect more from Nintendo than this. Throw away *Punch-Out!*'s human opponents in favour of clunky robots, reduce the charm factor by 50 per cent and add some slight 3D depth effects, and you've got *TeleRoboxer*. Use of the Virtual Boy's sprite scaling ability is limited to hokey 3D punches and mature players might find the action teetering dangerously close to one of those punchbag games you find in arcades, but younger players will probably appreciate the clatter. Clearly not the game it might have been with more Nintendo in-house spark, *TeleRoboxer* is no-frills 3D boxing at its most uninspired.

Panic Bomber

Hudson's *Tetris*-style theme is more notable for its use of floating background images than anything dramatically 3D about the gameplay, but an impressive introduction and good use of parallax helps keep this puzzle game memorable.

Vertical Force

An overhead shooter reminiscent of *GunHed* and *Super Star Soldier*, Hudson Soft's *Vertical Force* allows the player to fight in two layers (high up and low down). 3D parallax scrolling and enemies at different depths are the game's only noteworthy 'virtual' features, but the tried and tested *Star Soldier* play formula and boss characters give it a solid foundation.

Virtual League Baseball

Kemco's entry is a standard SNES-style baseball game with 'multiple 3D gameplay viewpoints', twoplayer compatibility and 20 teams (with 'realistic player stats'). Although the game doesn't look mindblowing compared to some of the baseball action on the Saturn, it's adequate for what it is: a low-cost, rushed Virtual Boy baseball game.

Multinational companies rarely take risks without good cause, and Nintendo obviously believes the Virtual Boy is a viable product. Although the first crop of games appears to contain more novelty value than hardcore gameplay, it's too early to pass judgement on the system's future. Remember, they said the Game Boy would never catch on... **E**

Advertainment

In which Edge studies the art of videogames marketing. This month: Sega goes ape on Japanese TV

Sega and Sony's tooth-and-claw struggle for domination of the Japanese high street has spilled over into the arena of TV advertising. In an effort to sway potential PlayStation punters in the direction of Saturn, Sega Japan recently ran a commercial depicting two chimpanzees abandoning their primal instincts in favour of videogames. Is Sega playing fair, or is this just monkey business?

Company: **Sega**
Product: **Saturn**
Date: **May 1995**
Origin: **Japan**



1 Two chimps, one called Segal and the other Anthony (very subtle), are playing with their new consoles. The games onscreen are just about visible: Segal is enjoying *Virtua Fighter*, while Anthony finds himself passing the time with Namco's PlayStation shooter, *Starblade*. 2 Suddenly, having decided that the PlayStation is boring, Anthony gets up, switches off, and wanders away, leaving Segal all alone with his Saturn. 3 Segal glances over briefly but doesn't follow because, of course, he's too engrossed in *Virtua Fighter*. The moral? *Starblade* isn't a patch on *Virtua Fighter*. Strange how Sega didn't pick *Tekken*...

Heavyweights unleash new **DVD** contender

Toshiba and Time Warner take on Sony and Philips in the DVD war

Toshiba and Time Warner have demonstrated their contribution to the future of digital storage at a UK press conference. Called the Super-Density Digital Video Disc (SD-DVD), the new format allows a feature-length movie to be stored on one disc and is supported by electronics giants including Matsushita, Samsung, Pioneer and Hitachi, among others.

A single-sided SD disc can store five gigabytes of data, or 142 minutes of video footage, while a double-sided disc has a capacity of 10Gb – over 280 minutes. The quality of the picture playback is astonishing, with excellent clarity, colour reproduction and registration. However, it wasn't clear whether the DVD players on show were finished hardware or merely mock-ups.

Of more relevance to the games industry was news of a rewriteable version of the SD disc, called SD-RAM. With a storage capacity of over 2.6Gb for a single-sided disc and 5.2Gb for a double-sided one, it represents a considerable advance over the 600Mb of conventional CDs.

Meanwhile, development is continuing on the rival DVD system from Sony and Philips. It remains to be seen which format will go the way of Betamax and which will become the industry standard for the next decade. The stakes are high.



Two prototype Toshiba SD-DVD players were on display, but there were no details about how much the hardware will cost



Photos courtesy of **What Video** magazine

17 major consumer electronics companies have elected to join the Toshiba/Time Warner digital video disc camp

UK **PlayStation** to get sub-£300 tag

Sony reveals aggressive plans for the retail price of its console

PlayStation.

Sony has announced its intended UK retail price for the PlayStation. The company has not set a RRP but confirms that the machine will sell at £299 when it is released early in September. This price will not include a game, but it is possible that a pack-in demo disc featuring current software and coming attractions will be available – a strategy that has already been seen in Japanese stores.

However the £299 figure has attracted opposition from retailers – both major chains and independent stores are concerned that it will cut their profit margins to an unacceptable level. Premium-price consumer electronics typically return a margin of around 25%, but it is believed that retailers could see as little as 15% from sales of the PlayStation. Although stores are aware of the PlayStation's huge sales potential and will have had their optimism boosted by the Saturn's promising start, the fact that no RRP has been set leaves the door open for a price-cutting war which could erode margins still further.

Given that the Saturn's £400 price tag delivers a higher return than the PlayStation's and that 3DO's retail margin is higher still, Sony will be relying on its brand name and enormous market presence to convince stores to stock the PlayStation in preference to the competition.

As in the US (where, instead of making a profit on the $299 hardware, shops will get a free piece of software for each unit sold), there are fears that Sony may have trouble meeting its proposed price – a figure nearer £330 has been suggested as more realistic.

No release date has been confirmed for the launch of the PAL machine, although the first week of September seems likely.

PlayStation in print

Future Publishing, the company behind Edge and a host of other fine computing and videogames magazines, has won the official license to publish Sony's PlayStation magazine. Edited by none other than Steve Jarratt, founding editor of Edge, *The Official PlayStation Magazine* will have access to all the latest PlayStation news and reviews and will feature a covermounted CD stuffed with demo software. It will hit the shelves in September, to coincide with the UK launch of the hardware.

Arcade **race** restarts

Japan's premier arcade companies enter the racing arena once again

Sega has unveiled *Indy 500*, the latest in its line of polygon-generated coin-ops, at an arcade exhibition in Tokyo.

In terms of graphics, *Indy 500* falls short of the standard set by Namco's F1 racing game, *Ace Driver*, released last year. Powered by Sega's enhanced Model 2B board (first seen in *Sega Rally*), the visuals are impressive, although they noticeably lack the Gouraud shading of the Namco game. Like *Ace Driver*, though, players can choose from three different circuits, and it will be possible to link up to eight units, *Daytona*-style, when the final version ships later this year.

Namco, not to be outdone by its rival, has also revealed its sequel to *Ridge Racer*, entitled *Rave Racer*. The new driving game, which has been undergoing testing in several Japanese and US arcades, boasts superior performance to the original and breathtakingly detailed graphics thanks to Namco's System Super 22 board.

Rave Racer offers several additional features, including a PlayStation-style external view and three extra tracks. The new courses contain banked corners, jumps, towns and bridges – on the challenging 'advanced' course you can even fall off the track. For an early glimpse of *Rave Racer* (and *Tekken 2*), check out Namco's new London arcade on Great Windmill Street, near Piccadilly, London.



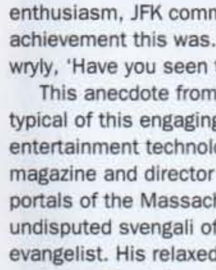
Sega's latest Model2 coin-op is *Indy 500* – previewed here at the company's recent New Machine Festival exhibition in Tokyo



***Rave Racer* is Namco's spectacular follow up to *Ridge Racer*. There are now three tracks and improved graphics**

Essential reading

Being Digital



- By Nicholas Negroponte
- Hodder & Stoughton
- £12.99

During a guided tour of the White House, Vladimir Zworykin, one of the pioneers of TV technology, was taken to meet John F Kennedy. Zworykin was introduced to the startled president as 'the man who got you elected'. 'How is that?' enquired JFK. 'This is the man who invented television' was the reply. In a burst of unbridled enthusiasm, JFK commented on what a terrific and important achievement this was. To which the god of the tube replied wryly, 'Have you seen television lately?'

This anecdote from the dawn of the information age is typical of this engaging and erudite look at communication and entertainment technology. Negroponte, a founder of *Wired* magazine and director of the Media Lab within the hallowed portals of the Massachussetts Institute Of Technology, is the undisputed svengali of digital culture, but he is no mere evangelist. His relaxed, canny style is more that of the cynical optimist: 'The information superhighway may be mostly hype today,' he concedes happily, 'but it is an understatement about tomorrow.'

The most important concept to grasp in the book is the distinction between bits and atoms. Bits are what we should be excited about. They have 'no colour, size or weight and can travel at the speed of light.' They are the underlying particle of digital computing. Atoms are, of course, the underlying constituent of the physical world but also, in Negroponte's sense, physical objects themselves. To illustrate: *Dirty Harry* digitised and pumped down a wire to your TV (ie VOD) is in bit form. On videocassette it is in atom form. The advantages of bit form are quality, malleability, speed and convenience, plus the fact that they don't have to be returned ($3 billion of the $12 billion US video rental business goes on late fines!).

The main body of *Being Digital* is devoted to arguing, in an entirely undogmatic way, the superiority of bits over atoms, but not without acknowledging and debunking the many failings and misguided efforts made in the name of progress. So while we can look forward to global harmonisation through 'thinking machines', we also learn that HDTV is a fiasco, that ADSL remains criminally ignored, that 'Sega and Nintendo will be extinct if they don't wake up to the fact that PCs are eating their lunch', and that the only reason the Chinese are laying fibreoptic cable rather than copper ones is because villagers dig up the copper to sell.

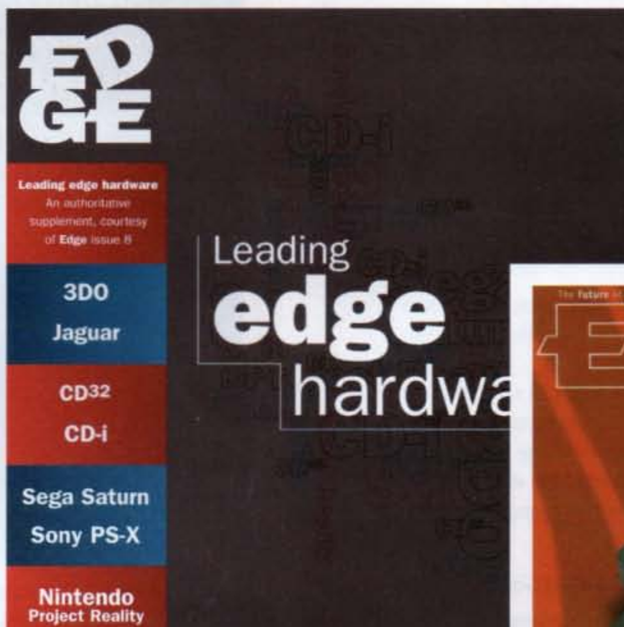


Express yourself in **Edge**. Write to: **Edge** letters, 30 Monmouth Street, Bath, Avon BA1 2BW

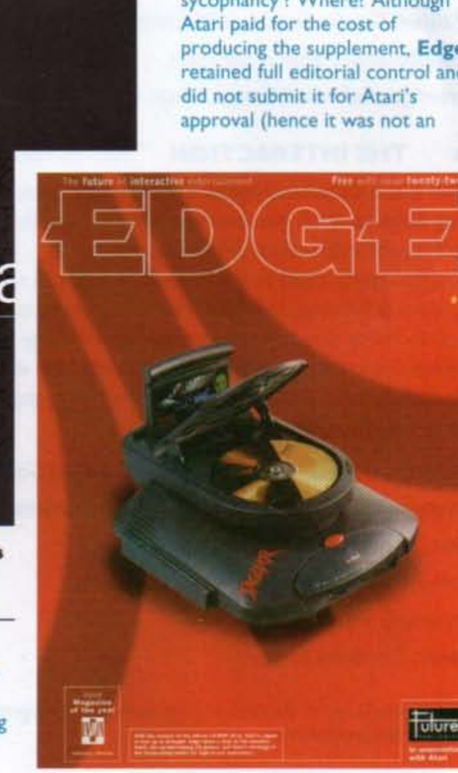
So it's **Edge** magazine in association with Atari now, is it? The Jaguar through rose-tinted spectacles? Of dear. Of course, this kind of bland 'advertorial' is nothing new, but I can't help thinking that this is a particularly cynical move on your part. Atari has no doubt paid a hefty amount of cash into Future Publishing's coffers for this coverage, and obviously, if the supplement had been produced purely as a 16-page Atari ad, most readers would have hurled it straight into the nearest bin. However, it's difficult to see how Atari will profit from this exercise, given that the average **Edge** reader is not entirely stupid. I can appreciate that it must be fairly loathsome having to churn out such vapid stuff to order. Indeed, it certainly appears that the entire supplement was written with a tongue-in-cheek attitude. Such banal sycophancy is so out of step with your normal editorial stance toward the Jaguar that it all comes across as totally ridiculous.

It's not your job to promote consoles in return for cash. That's one thing that magazines are definitely not for. The Jaguar should be allowed to succeed or fail on its own merits, and **Edge** should be reporting on it with the accuracy we have come to expect. Please stop insulting our intelligence with such drivel, or at the very least use the expression 'Advertising Feature' on the cover of any further 'supplements' – a convention many other magazines adopt in these circumstances.

Andrew G Gibson, Colchester



A tale of two supplements: Leading Edge Hardware was an Edge success story (see David Shanks' letter), but the Jaguar supplement met with rather less approval



The question of 'advertorial' is a contentious one: to what extent does accepting sponsorship of this kind compromise a magazine's editorial integrity? As far as **Edge** is concerned, there is a distinct line between simply providing information in association with a third party, and deliberately pulling the wool over people's eyes in order to further a company's commercial interests. The Jaguar supplement did not cross that line. **Edge** takes its status as an impartial commentator on the videogames scene very seriously and would not abuse its readers' trust by publishing blatant propaganda.

Your implication that **Edge** was essentially bribed by Atari to say nice things about the Jaguar is simply not true. 'Banal sycophancy'? Where? Although Atari paid for the cost of producing the supplement, **Edge** retained full editorial control and did not submit it for Atari's approval (hence it was not an 'advertising feature'). Atari merely employed **Edge**'s expertise in magazine production to inform readers about what the Jaguar had to offer. **Edge** regarded this as a service to its readers and did not make a profit on the exercise.

viewpoint

Here are just a few suggestions for your magazine.

In issue 8 we received a supplement entitled Leading Edge Hardware. It was a great source of information in every respect, and at the end you told us that you intended it to be 'the first in an annual series of **Edge** supplements that will examine the new technologies as they appear and develop over the coming years'. Please live up to this promise and produce such a supplement, this time telling us which of the machines you actually cover. You could give us a progress report and tell us how the actual products compare in real life to their creators' dreams.

Please, please bring back the charts and This Month On Edge sections. They show the world at present, not just in the future, and that you are human (just like the rest of us).

In your articles you tend to have a lot of empty space down either side of the page. I think this could be put to good use by containing a glossary. The glossary could set about explaining words in your article that we may not have come across before.

Please bring back Datastream.

Finally, thanx for a great magazine which surpasses every other. A few days ago I met a man who had just bought a PlayStation, and yet I knew more about it than he did! I'm still wondering how you manage to obtain information six months before all the other journalists get a sniff at it.

David Shanks, Stockport

The Leading Edge Hardware supplement was very popular, and you'll be pleased to hear that a follow-up is indeed in the works. However, rather than being packaged with **Edge** itself, it will take the form of a one-off, standalone magazine, which will go onsale in the autumn.

This Month On Edge may well grace the pages of the magazine again, but it was decided that it was better to use **Edge**'s precious editorial space for news, previews and reviews rather than less games-related items like TMOE. This was also the reason for the disappearance of Charts, Over The Wire and, more recently, Datebook. However, other features like I Wish, Datastream, Attract Mode and Advertainment will continue to appear on an occasional basis, as space allows.

After reading your July editorial on SNES games, I simply had to put pen to paper. I do agree that most US-sourced games have been quite poor (in my opinion quality games equals Japanese games) but stating that 'nothing happened' during most of the SNES's life is just not true. You mention several SNES games. I could add *Super Metroid*, *Final Fantasy 3*, *Super Mario All-Stars*, *Donkey Kong Country* and *Chrono Trigger*, to name but a few.

I don't consider myself a Nintendo loyalist – Nintendo has its faults, just like Sony and Sega. It's just that, on balance, these games are much more fun and have better gameplay than anything I've ever played on my Mega Drive or PC (apart from *Doom*). And yes, I have tried *Ridge Racer* and *Tekken* on the PlayStation. Speaking of which, I did initially intend to buy a PlayStation – the only interesting piece of hardware currently available – but the recent announcement that Ultra 64 will be launched with quality NCL software (and not just crummy US games) in early 1996 has made me rethink my plans. Since gameplay is all-important to me, I've decided to drop the PlayStation in favour of the Ultra 64. Until then my trusty Super NES will do me fine, thank you very much.

Carsten Brandt, Denmark

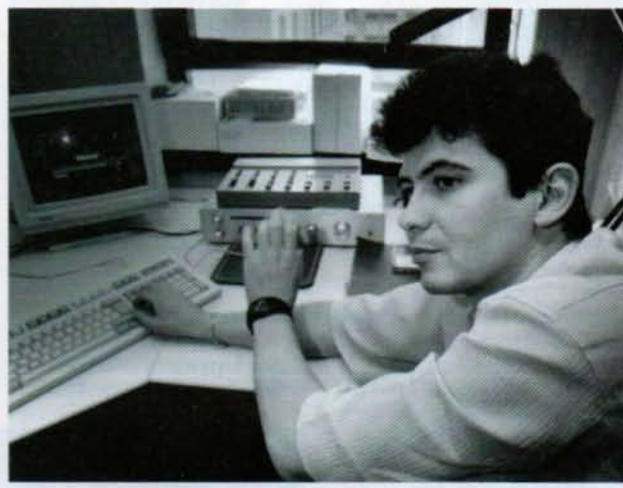
The titles you mention are indeed fine games, and true, the SNES did play host to superlative titles later in its life, such as *Super Mario Kart*, *Stunt Race FX* and *Street Fighter II*. However, considering that the machine is now approaching five years old, it's disappointing that so few software companies have really exploited its hardware. Perhaps new SNES games such as Nintendo's *Yoshi's Island* and Square Soft's *Secret Of Mana 2* will prove that, when pushed, the machine can still hold its own against the new breed (and perhaps even beat them hands down in terms of gameplay). If Nintendo's commitment to playability is retained for the Ultra 64, **Edge** would certainly have no argument with your decision to wait for the 64bit machine.



With the SNES still boasting high-calibre games like *Secret Of Mana 2*, Carsten Brandt reckons he'll stick with Nintendo's 16bit machine

I would like to agree with the letter written in **Edge** 20 by Imran Ali. For over a year I have been buying **Edge** and have found it invaluable in terms of the latest information in the whole area of the multimedia industry. As a computer animator with some years' experience and an interest in the whole games area, I have naturally applied for some of the positions advertised each month. Imran Ali was lucky to get one reply to his many applications – I did not receive any! If these companies are serious about developing the games industry, they should be encouraging and training the raw talent out there. If applicants are not successful, it might prove to be in the companies' interest to encourage them by at least replying to them and/or returning work samples with constructive comments.

Caroline Peeks, Dublin



For every successful game designer (Fréderic Raynal, above), there are many prospective employees shunned by the industry

It doesn't seem unreasonable to expect companies to at least respond to job letters, if only to tell applicants that they were unsuccessful. The games industry does tend to act rather like a closed shop, and its haughty attitude to approaches from outside is a constant source of frustration for many talented and enthusiastic individuals.

Budding animators and game designers may be interested to know that a feature about job opportunities in the games industry is planned for an upcoming issue of **Edge**.

Continued next page

viewpoint



Edge agrees with John Katsikas that Acorn's impressively specced RISC PC has huge potential, despite its relative lack of commercial success

Continued

I have been a RISC PC 600 owner since last May, and although you do not mention my computer in your pages very often, I often buy your magazine because I think it is one of the best written and most accurate magazines in the computer world. However, in **Edge** 17 I was disappointed when you told Paul Riggs from Derby that PowerPC cards will not be available for the RISC PC, and even more when you published James Coates' letter in **Edge** 19: the phrase 'now all **Edge** needs is a RISC PC' sounded very ironic to me (correct me if I'm mistaken).

I would like to add some more information about the RISC PC. Simtec already makes a board that fits on the RISC PC's second processor module and can take up to six extra processor cards in addition to the ARM 600. These cards can have any processor on, from the ARM 600 to the ARM 800 (when it becomes available at the end of the year), as well as the 486, Pentium and PowerPC. At the moment Simtec uses six ARM 700 processors which it claims gives the machine 250MIPS and five times the processing power of the best Power Mac on the market at the moment. Also, *RISC OS 4* will be based on the *Taos* operating system [see **Edge** 8] and Acorn is planning to release a machine for under £2000 in a couple of years with an operating system based on *RISC OS* and *Taos* which, by using parallel processing and ARM processors, will be more powerful than a mid-range Silicon Graphics machine.

Acorn might have a small userbase but, believe me, it is a kind of religion for us.

John Katsikas,
Colchester

As Edge has said before, the RISC PC is a versatile and powerful system that is criminally undervalued. The 'Now all **Edge** needs is a RISC PC' comment was not meant to be ironic; it was in fact a thinly disguised (and completely unsuccessful) hint to Acorn that it was welcome to provide the **Edge** office with a free machine…

I n Spain last month I bought a copy of *Ultima*, an imitation **Edge** magazine which came with a free video of demos from all the new systems and arcade games. A very practical way of seeing what these machines can do. How about it, **Edge**?

Also, please desist from using the Silicon Graphics 'glamour' versions of images from computer games (Rare's *Donkey Kong Country* springs to mind). Would the marketing of such a feeble game as *Rise Of The Robots* have got anywhere without those very misleading raytraced glossies? As the closest thing we have got to a magazine of record, please stick to screenshots.

J Alexander,
Cardiff

Covermounting items like videos is prohibitively expensive – it's generally only used as a one-off marketing ploy to attract attention to new magazines or arrest declining sales. **Edge** falls into neither of those categories – and it's already a relatively costly magazine to produce – so you're unlikely to see freebies of that nature sellotaped to the cover of this particular journal.

Unlike many other magazines, **Edge** is always careful to use genuine in-game shots rather than irrelevant pre-rendered ones. However, sometimes rendered artwork is all that's available, and **Edge** has to either use it or not cover the game at all – which is even more of a disservice to the reader.



What's the point of buying a console capable of 'arcade quality' visuals if its games run in a letterboxed PAL display? asks Jason Payne

N ow that the world of next-generation consoles is upon us, I begin to wonder about the compatibility of such machines. I refer, of course, to their screen displays.

Now, it would seem pretty stupid to buy a Sony PlayStation that promises arcade-style graphics, only to plug it in and find that it has a 50Hz display complete with black borders at the top and bottom. I personally think that anyone who can afford one of these machines should be able to complement it with a decent TV/monitor that can cope with a 60Hz fullscreen display.

While I'm on the subject, none of these new machines should carry an RF output. I know that RF-only TVs can produce a fullscreen display, but the different between RF and SCART is absolutely astonishing. I myself own a Mega Drive with an unofficial speed selector switch which enhances its playability tenfold. I can only hope that both Sega and Sony take note of this before claiming to be the next step forward.

Jason Payne,
Walthamstow

Edge has long championed the superiority of imported consoles over official UK PAL systems – there's simply no comparison between running a game as it was intended – at fullscreen and full speed – and a fuzzy, squashed, slower version complete with ugly black borders. Although most UK TVs will display a fullscreen 60Hz signal (through SCART), games manufacturers need to be certain that their hardware will work on *any* television, and that means a screen update of 50Hz.

Fortunately, UK PAL versions of newer consoles such as the 3DO, Jaguar, Saturn and PlayStation do not suffer from the same restrictions as 16bit machines like the SNES, where a game's speed is keyed off the video display rate. Instead, the hurdle is now reprogramming: because most console games are coded for the 525-line NTSC standard, getting them to occupy the 625 lines of the PAL system means adding graphics, which in turn demands more processing and results in a slight fall-off in speed (although nothing like the 17% drop that owners of 16bit consoles are used to). Reassuringly, both Sony and Sega seem keen to put the necessary effort in – the PAL version of Psygnosis' *Wipeout*, for example, runs at fullscreen and only marginally slower than its NTSC counterpart.

Prescreen

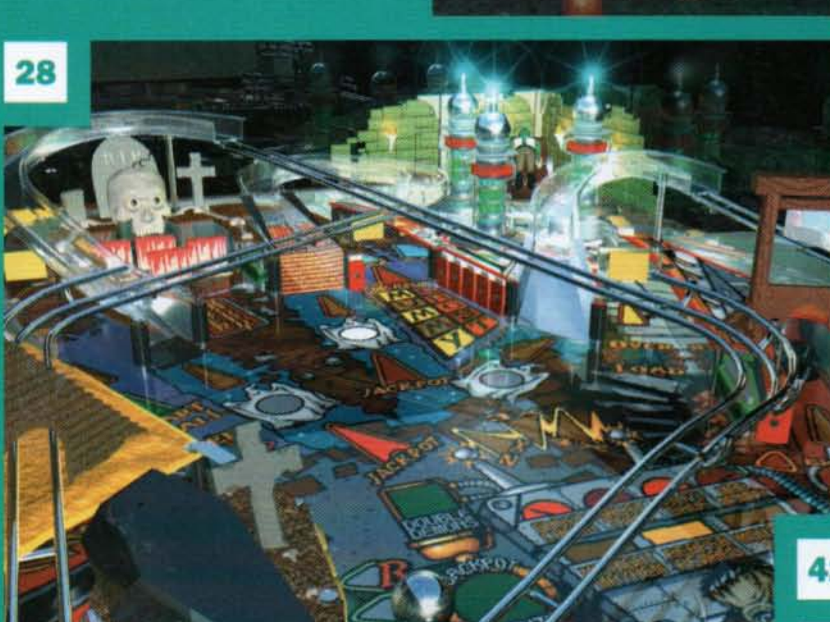
Despite all the techno-wizardry offered by the super-consoles, a humble SFC game dominates this month's proceedings. The game is *Yoshi's Island*, the latest product of the Miyamoto gameplay factory, and it will probably be singlehandedly responsible for extending the life of the SNES.

Elsewhere, *Tekken 2* seems a worthy successor to Namco's excellent original, and 3D Realms has a range of impressive-looking 3D titles in the offing for the PC.

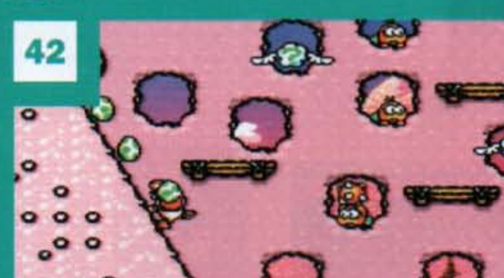
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24



Tekken 2



The follow-up to Namco's superlative polygon fighting game boasts redesigned characters, two new fighters and a range of extra moves

Format:	**PlayStation**
Publisher:	**Namco**
Developer:	**In-house**
Release date:	**March 1996**
Origin:	**Japan**



***Tekken 2* is powered by Namco's System 11 arcade board. Ten characters are on offer, including some old favourites (top, above)**



Michelle is sent sprawling by Yoshimitsu's sword. The moves from the original game will be supplemented by a selection of new ones





The two new characters, Jun and Lei (top), fight it out in the setting sun. Heihachi (formerly a boss) is now playable and has turned Samurai

Just four months after creating what many regard as the finest beat 'em up ever to grace a console, Namco is hard at work on the inevitable sequel. *Tekken 2* – which will debut as a coin-op later this year before being converted to the PlayStation in early 1996 – will include all the basic elements of the original, but Namco is working on honing the gameplay and graphics, in an obvious attempt to usurp *Virtua Fighter 2* from its position as the premier fighting game of the moment.

What this means is a complete graphical overhaul. One of the few complaints about *Tekken* was that the layers of parallax were unrelated, so every background will be replaced in an effort to make them seem more integrated. The fighting arena will also scale much further out, effectively providing an unlimited combat zone.

Criticism was also levelled at *Tekken*'s character design. For the sequel, every fighter will receive a redesign, be it a size alteration or a simple change of clothes. Two new characters will make an appearance, too: Lei, a Chinese police officer, is skilled in Chinese martial arts, while Jun, a anti-animal-smuggling activist , fights aikido-style against heavier opponents. Heihachi becomes a main character, and Kazuya is promoted to boss status. The PlayStation version

















This church scene is one of the new backdrops (top left). *Tekken*'s camera selection modes are likely to be changed for the sequel (top right). The remodelled Jack launches Law into orbit (left). Heihachi shows Paul who's boss (right)

From bottom: The scenery zooms out as far as you like; although some characters have weapons, Namco is withholding a full armoury for use in another fighting game currently under development; some moves seem to be equally damaging to both participants

will undoubtedly allow the sub-bosses to be controlled too.

Namco still believes that *Tekken*'s gameplay has room for improvement. Characters lying on the floor were particularly vulnerable to follow-up attacks, so a 'quick recover' move will be included in *Tekken 2*, as well as the opportunity to move into and out of the screen, *Toh Shin Den*-style. In a bid to make the game more attractive to experienced players, the ten-hit combos will be enhanced to allow more moves to be incorporated, and each fighter will also gain extra moves. Another, incidental, change is that *Gaplus* will replace *Galaga* as the classic game featured during load-up.

Namco's arcade division certainly isn't resting on its laurels. As well as *Tekken*, another 3D polygon beat 'em up is well into development at its Tokyo HQ (it's thought to be a *Tekken*-style game featuring weapons and projectile attacks). This, coupled with *Rave Racer* (see news), should keep Namco at the forefront of arcade game design. **E**









The 10 fighters visible on *Tekken 2*'s selection screen (top left) won't include any of the sub-bosses available in the home version of *Tekken*. Nina takes on Jack (top right). A trip move (above left). All the characters will still boast individual victory sequences (above right)

Loaded

Format:	**PlayStation**
Publisher:	**Gremlin**
Developer:	**In-house**
Release date:	**Autumn**
Origin:	**UK**

The PlayStation has had its fair share of maze shoot 'em ups, but so far none has approached *Doom* standard. Gremlin's latest creation could get a little closer



After failing to produce a single outstanding game in its recent history, Gremlin has been tempted by the new consoles to return to the fray with a vengeance. The result is *Loaded*, a game that aspires to the playability of *Doom* and *Gauntlet* while lavished with 32bit production values.

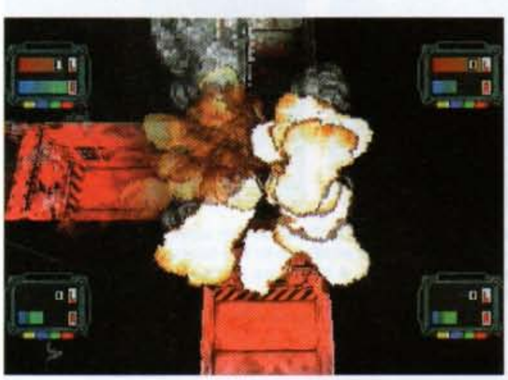
Loaded is a top-down blaster, pure and simple. The plot, as usual, is irrelevant to the gameplay, but it does provide an excuse for plenty of carnage. You play one of six gun-toting mercenaries attempting to break out of a prison to fulfil the evil plans of its owner. Extreme violence is, of course, crucial to this task: enemies collapse into pools of blood with a satisfying squelch and there are plenty of meaty weapon power-ups.

The prison consists of 12 vertically stacked levels. A top-down perspective is used throughout, which provides a clear view of the action. The only drawback is that it also lets you see the denizens of the next rooms, thereby reducing the suspense as the door slides open – which is what made *Doom* such an intense experience.

Gremlin has made every effort to create a 3D environment by including *Clockwork Knight*-style parallax scrolling and perspective-scaling ramps and stairs in the level design – whenever you ascend or descend, the view zooms in or out with an impressive lack of pixellation.



The forced-perspective, top-down display facilitates control of your character





Each of the six characters in the game has a unique weapon, which can be powered up five times to produce spectacular explosions like these (left). And this is the heartwarming result: liquidised enemies (right)







Yet more enemies are dispatched with maximum gore (top and middle). An explosion lights up the room (above)





Some of these security doors (top) can only be opened with the right access card. Psychedelic swirlings à la *Jumping Flash* (above)









The scaling routines in *Loaded* are some of the best seen so far on the PlayStation. When the view zooms out, the lighting remains accurate and pixellation is kept to a minimum

Each room is gaudily coloured, marking a departure from the dark, dungeonesque environments of other maze games like *Kileak The Blood*, *Doom* and *Space Griffon*. And the day-glo interior design looks even more impressive when weapons are fired, their flashes casting eerie shadows on the walls.

The weakest aspect of *Loaded* is arguably its character design. In the game proper you get badly defined sprites with little or no recognisable traits (largely because the viewpoint restricts what can be seen), while the character artwork (depicting the likes of Fwank, Nobby, Cap'n Hands, Vox!, Mamma and Bounca) is unsubtle and seems overdesigned.

Loaded allows four players to join forces, *Gauntlet*-style, courtesy of the PlayStation link-up cable. However, Gremlin has deliberately chosen to keep the gameplay as simple as possible and the tactical element is unlikely to be as sophisticated as it was in Atari's masterpiece.



The blood in *Loaded* may be cartoony rather than realistic (*Doom* is much nastier) but it's still suitably violent

Whether *Loaded* will offer enough challenge and variety to match its visuals will be apparent when it debuts later this year. But the fact that Gremlin has chosen to exploit the 2D potential of the PlayStation as well as its 3D muscle will give the machine some much-needed diversity. E



Tilt

Pinball is a perennial videogame favourite, but it has always suffered from being too, well, flat. That's now about to change…



Format:	**PC CD-ROM**
Publisher:	**Virgin**
Developer:	**NMS**
Release date:	**September**
Origin:	**UK**

Every so often a piece of software comes along which improves on an established game style to such an extent that it's as if it had invented a completely new genre. *Tilt* is just such a game.

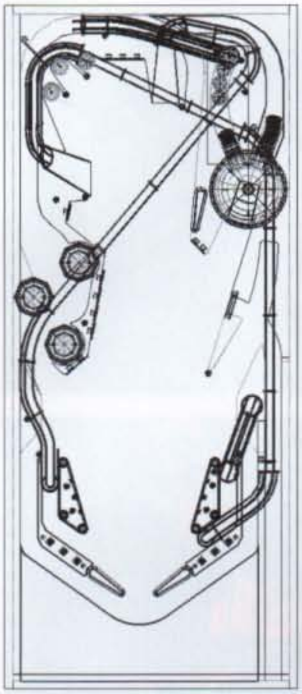
Whereas all previous attempts at replicating pinball on a computer have consisted of 2D representations of a three-dimensional table, *Tilt* offers a 'player's eye' 3D perspective which is infinitely more appealing. Although



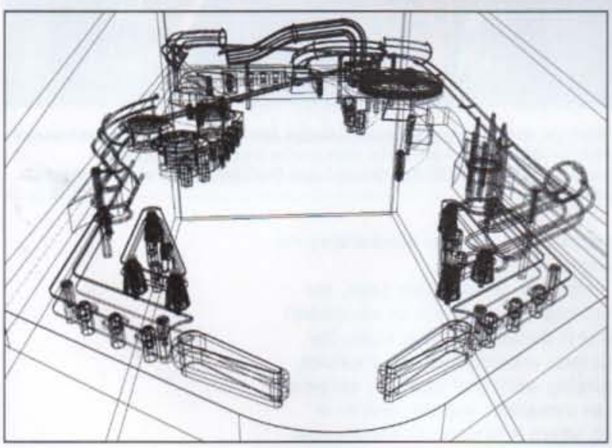
***Tilt* offers a 'player's eye' perspective which is infinitely more appealing than the traditional 2D view**



***Tilt*'s gameplay is derived from a blend of technical and artistic excellence. A sumptuous *PowerAnimator* rendering of the Fun Fair table (main). During the game, around half of the table is visible at any one time (above left)**







Evolution of a table: the original artwork (top left) develops into a wireframe model (above), which provides the basis for later rendering





An untextured incarnation of the Space Quest table (above middle). The finished version with art and textures applied (inset)

the finished game will allow instant switching between 2D and 3D modes, few players are likely to be content with the traditional view once they've sampled *Tilt*'s 3D delights.

A 3D table has been the obvious next step for the pinball game ever since the release of the seminal *Pinball Dreams*. However, it's only recently that the computing power to shift sophisticated images at an acceptable speed has been widely available. Full marks to NMS for being the first developer to exploit this increased power in a pinball title.

NMS is unwilling to divulge the inner workings of the program, but part of the secret involves loading around 75 pre-rendered images of the table into memory at the start of play and then displaying the relevant ones as the ball moves around. This approach avoids the need for scaling bitmaps, with all the associated pixellation problems.

But just

as important as the technical merits of the 3D engine is the design of the tables themselves. **Steve Beverley** and **Jon Harrison** spent several weeks working on each table. 'We started off by dismantling a real pinball table,' recalls Harrison. 'We took everything apart, from all the ramps to every single individual bulb, and measured them.'

These objects were then recreated in Alias' SGI-based rendering package, *PowerAnimator*. 'Initially we used *3D Studio*,' admits Beverley, 'but looking at the *PowerAnimator* results, they're so far ahead it's impossible to think of not using SGI kit.' The attention to detail at this stage was such that in the

'We started off by dismantling a real pinball table. We took everything apart, from the ramps to every single individual bulb, and measured them'

Continued next page

finished tables, even rivets and welding marks are exactly where they should be. There's also an impressive variety of transparent and reflective textures.

The next step was to add the table artwork. According to Beverley, this is where other pinball games fall down. 'All professional tables tell a story and work as a whole, rather than as several disjointed pictures and ramps as you often see with computer tables out there.' This purism (combined with undeniable artistic talent) has allowed NMS to produce tables that offer an integrated environment and wouldn't look out of place in an arcade.

Like computer pool, pinball has to contend with the argument that it's just as easy (and arguably more enjoyable) to simply go to a pub and play the real thing. Which is why NMS has deliberately added elements not found in real pinball. Short cut-scenes are triggered when events like ball lock occur, and 'side games' are also on offer, including one where you get to fire the ball out of a gun and another which involves bombarding the walls of a castle.

After the design of the table, the most important element of any pinball game is the ball. In many titles, the ball feels unconnected to the surface, bouncing oddly and generally behaving in an unrealistic manner. Not so in *Tilt*, where it exhibits all the physical properties of its real-world counterparts. Not only does it move fluidly, but its silver surface accurately reflects whatever is around it.

Tilt has the potential to be a landmark game. It combines genuine programming virtuosity with stunning design – the superbly realised tables make even some of Williams' efforts look average. With versions scheduled for PC, PlayStation and Saturn, NMS could be heading for a major multiformat hit. ■







The Gangster table features a shooting subgame, triggered when the ball is locked (top). NMS has employed Alias' particle rendering system to good effect (middle). More stunning table design (above)





Wizards, dragons and serpents inhabit the Dungeons & Dragons-esque Mystic table (top) – note the impressive transparent ramps. Unsurprisingly, the Space Quest table (bottom) has a cosmic theme



Credits

Design: Steve Beverley
Design: Jon Harrison
Programming (PC): Paul Proctor & Stake
Programming (PlayStation): Glenn Benson
Programming (Saturn): Chris Urquham and Phill Trelford
Managing director: Richard Chappels

Foes Of Ali

Format:	3DO (version shown), PC
Publisher:	Electronic Arts
Developer:	EA Sports
Release:	October
Origin:	US

EA's first boxing game looks like being a distinguished addition to the company's range of top-quality sports sims







A multitude of thirdperson camera views from around the ring should give *Foes Of Ali* more versatility than any previous boxing simulation

Electronic Arts is one of the few developers to have exploited the potential of the 3DO – any list of the best games for the machine would have to include *Madden*, *FIFA* and *Road Rash*. And EA's latest sporting game, *Foes Of Ali*, is a boxing sim which looks even more impressive than PlayStation title *Boxer's Road*.

You can choose to fight as either Muhammed Ali or one of his illustrious opponents. Three modes enable you to fight a single exhibition bout, play through Ali's historic contests or build a career of your own.

Multiple camera angles give the fights a suitably televisual feel, but it's the firstperson perspective that looks most spectacular. Your gloves swing in from left and right, and as they connect, your foe's face gradually becomes covered in cuts, bruises and swellings. If his punches land on you, you suffer double vision and literally see red as blood fills your eyes.

The motion-captured, texture-mapped polygon fighters have all been designed to fight in the style of their real-life counterparts – a similar feature to Electro Brain's *Legends Of The Ring* on SNES and Mega Drive.

Foes Of Ali looks like being another polished, playable 3DO title from EA. It's a shame that other developers can't seem to produce games of similar quality on a machine that's crying out for them.

The motion-captured, texture-mapped polygon fighters have all been designed to fight in the style of their real-life counterparts





The excellent blurred vision feature (top). Muhammed Ali himself (middle). An evocative top down view (above)







Late on in a fight your opponent is a mess of cuts (top) and you're looking through a film of blood (middle). But it's he who ends up on the canvas (above)

Bladeforce

Studio 3DO's latest gets a new lead character, but it still seems like a 3D engine searching for some gameplay

Format:	**3DO**
Publisher:	**Studio 3DO**
Developer:	**In-house**
Release date:	**September**
Origin:	**US**



This version of *Bladeforce* is still devoid of airborne foes – the only enemies are the many (largely unanimated) gun emplacements which spit out uninspiring green stars at the rotor-sporting hero



As you swoop in low over these *Blade Runner*-style pyramids, the graphics engine banks and tilts with impressive speed

Studio 3DO's Bill Budge has invested a great deal of time and effort in developing and perfecting the 3D graphics engine at the heart of *Bladeforce*. The result is a very capable game environment, complete with depth-cued structures (including some very *Blade Runner*-esque pyramids) which emerge eerily from the mist as you approach them (an effect which also enables the game to move at a decent pace).

Bladeforce certainly has the best flight engine seen on the 3DO. You fly in low between buildings, banking fiercely to avoid electric fences and walls, swooping down at the ground and then pulling up at the last minute. It's fast (around 30fps) and, on occasion, exciting.

The engine is a creditable achievement but it remains to be seen whether the game will be. At this stage, there's still no discernable game structure – all you do is cruise around the levels, shooting gun emplacements (there are no airborne foes yet) and collecting items to top up your fuel, shield and weapon levels. The levels themselves seem to be fairly bland, made up of disappointingly basic blocky elements.

One major change since the version showed off by 3DO earlier this year is the lead character. Studio 3DO has now jettisoned the stiff and unappealing 'action man' who originally bobbed around in the centre of the screen in favour of a bigger and equally unattractive hero – all you see onscreen is his upper body, complete with implausibly slow-turning rotor blades and Superman-style outstretched arm.

If Studio 3DO can make a few graphical tweaks and introduce some well-structured gameplay, *Bladeforce* could yet be a winner. But shouldn't gameplay be the first consideration in any title?







Bladeforce's dense 3D world looks good but as yet it lacks any solid gameplay





Bladeforce's dire attract mode is a poorly animated and edited Cinepak 'extravaganza'



Duke Nukem 3D (above), ***Blood*** (below) and ***Shadow Warrior*** (bottom left)



3D Realms

3D Realms has already raised a few eyebrows with *Terminal Velocity*. But it seems that was only the beginning. **Edge** makes its way to the Lone Star State, where the company is busy building a 3D empire

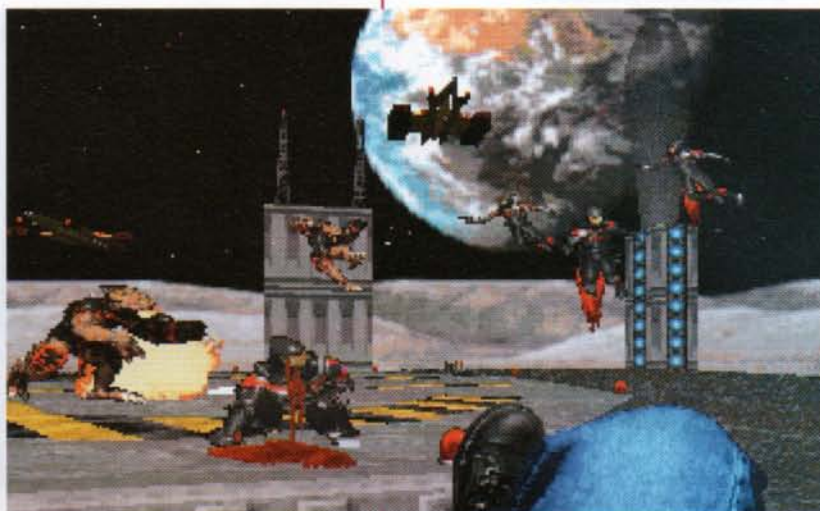


Forget swimming pools and conservatories – to get one over on the Joneses these days, it seems you've got to have your own 3D engine. Argonaut has just proudly put its *BRender* engine on display in *FX Fighter*. Washington DC-based Bethesda reckons its *Xngine*, to be used in the forthcoming *10th Planet* and *Dagerfall*, is at least three times faster than everyone else's. Id will doubtless have similarly wild claims to make about its *Quake* engine. And in the suburbs of Dallas, Texas, 3D Realms is putting the finishing touches to its *Build* engine, which will, of course, be better still.

But, rather than 3D graphics technology or its recent success, *Rise Of The Triad*, 3D Realms is perhaps best known for pioneering the shareware concept of PC games publishing, through its alter ego, Apogee. Having spread cut-down shareware versions of id's *Wolfenstein 3D* across the world's bulletin boards, it found that people were only too happy to send in their registration fees to obtain the full version. And id, impressed by the success of the technique, exploited it to its full extent with *Doom*.

'We started marketing our games as shareware because it was an inexpensive way to get started,' explains 3D Realms president **George Broussard**, striding through the company's rapidly expanding network of offices and corridors.

'It's a method that works very well for us,' adds **Scott Miller**, 3D Realms vice president and also, confusingly, Apogee's co-president. 'And not just in terms of sales. We can put out an early beta version of a game and invite people to contact us



Striding around a space station in *Duke Nukem 3D* (above and below), Duke kicks and shoots his way through his enemies



Ken Silverman

With the *Build* engine, created by teenage programming genius Ken Silverman, 3D Realms is moving into 3D games in a big way



with their opinions. If what they say makes sense, we can incorporate their ideas into the finished game. In the case of *Terminal Velocity*, for example, we were inundated with requests for a mouse option. So we put one in, and it turned out to be by far the best way of playing the game. I kept getting thrashed in the network game until I realised that the guys in the other offices were using the mouse.'

3D Realms wasn't responsible for developing *Terminal Velocity*, though; that was the work of Terminal Reality (which is producing an uncannily similar game for Microsoft as one of the first *Windows 95* releases). But with the *Build* engine, created single-handedly by teenage programming genius Ken Silverman, 3D Realms is moving into 3D games development in a big way. Indeed, the company was launched as an offshoot of Apogee for this very purpose.

Duke Nukem 3D is the first – and most talked-about – game to make use of the *Build* engine. It picks up where the platform game *Duke Nukem 2* left off, with Duke returning to Earth to find it occupied by aliens. But it couldn't be a more different game, as George Broussard explains: 'The main advantages the *Build* engine has over something like *Doom* are that you can walk over bridges, have true rooms above rooms, swim underwater, have mirrors on the walls, have translucent objects, ride in vehicles like shuttle cars or subways, look up and down, duck, crawl, jump, fly…'

Continued next page

Broussard then proceeds to demonstrate these capabilities on a PC running the game. Duke is standing in an LA street next to an burning police car. A key is pressed and a jetpack launches him high into the air. As the devastation continues in the streets below, he touches down on top of a skyscraper and makes his way to the edge of the roof, from where we can peer down into the streets far below. *Doom* purists claim there's no need for a look-up-and-down facility, but once you've experienced the vertiginous delights of *Duke Nukem 3D*, you'll think differently.

3D Realms is hugely enthusiastic about *Duke Nukem 3D*, and eager to show off just how much work it has put into making the environment as interactive as possible. The *Build* engine's flexibility means that pretty much anything goes in *Duke Nukem 3D*. In the moonbase, you can fire a rocket through a door and across a room to blow out the window on the other side. The resulting depressurisation causes all the aliens in the room to be sucked out – and you too if you don't close the door in time. You can open cupboards; destroy furniture; use mirrors to look round corners; blow out ventilation panels and then crawl through the ducts behind them; stand on balconies and fire on the aliens below; walk into bars and shoot all the bottles behind them; watch wounded aliens grovel at your feet before kicking them in the head; shrink aliens with a special gun and squash them under your boots; jump aboard a moving underground train and kill aliens as you wind your way through tunnels; run around a full-sized oil tanker, jumping overboard if you want and swimming underneath it...



With its blood-soaked, atmospheric 3D environment, *Shadow Warrior* owes an obvious debt to the seminal *Doom*



'Shareware works very well for us. We can put out an early beta version of a game and invite people's opinions'

Scott Miller, vice president, 3D Realms



Some of the rooms in *Shadow Warrior* are impressively large (above). An oak-panelled room is home to these fellows (below)



All this is enhanced by the range of different viewpoints on offer. 'You don't always have to view the action through Duke's eyes,' explains Broussard. 'You can have him running on the screen in front of you, or you can view him through a series of remote cameras which are positioned in each room. In fact, in the multiplayer game you can use the cameras in different rooms to spy on your opponents.'

And then there's the replay facility: 'When you've finished a game you can replay the whole thing, editing the camera angles as you like. And because there's so much going on the whole time, the result looks more like an "interactive movie" than anything else I've seen. In fact, perhaps the future of interactive movies lies in games like this, rather than ones which take pre-recorded video footage and try to make it interactive.'

Nearby, a 3D Realms staffer is drawing rectangles on a grid displayed on his computer screen. 'That's the

construction tool we use to design *Build* games,' explains Broussard. 'We've written it ourselves to make the process as simple as possible. And we'll be including it with the game, as we want to encourage players to design their own levels and circulate them freely.' Would-be *Doom* designers have no such luxury, having to make do with the data formats supplied by id.

Being developed alongside *Duke Nukem 3D*, although a little behind it, are a number of other *Build* games. One of these is *Shadow Warrior*, which places you in an Oriental fortress populated by shuriken-wielding Ninjas. Rather unfairly, however, it arms you with a pair of Uzis against which martial arts seem a little ineffectual.

Then there's *Blood*. 'This is a bit more of a gothic horror game that will be very spooky to play,' enthuses Broussard. 'The evil subconscious thoughts of mankind have taken on material form, and you've got to run around a castle attacking them with pitchforks and things. What's especially good is the way you can combine objects.'

You can, for example, pick up an aerosol, which isn't much use on its own, but if you combine it with a cigarette lighter you've got yourself a flamethrower. And there's also a power-up which makes you invincible as long as you keep killing monsters, so you have to dash around in a crazed frenzy to keep the effect going.

The graphics look appropriately dark and moody, with zombies and grim reapers wandering around, and there's an excellently designed fireplace in one room,



With four games scheduled for release over the next nine months (*Blood*, above), 3D maze addicts are in for a treat

'We have an even newer 3D technology that we're using for our next games. Most – if not all – of our future games will feature true 3D movement with six degrees of freedom'

George Broussard, president, 3D Realms



In this scene of *Blood* an improvised flamethrower is your only form of defence against a variety of bloodthirsty nasties





Impressive parallax effects are achieved in *Duke Nukem 3D* (above). Big guns are, of course, an essential element too (right)

with the flames blazing in the mouth of a huge skull.

Finally, there's *Ruins*, which is due for completion early next year. You play a modern-day Indiana Jones type who has discovered that the pyramids were built by an alien race, who plan to use them as mind-control devices to enslave mankind. It sounds horribly like *Stargate*, but, says Broussard, 'You'll actually feel you're in ancient ruins and pyramids, pushing blocks of stone, discovering secret passages and blasting mummies at every turn.'

So, what of the future? More *Build* games? 'Actually, no,' says Broussard. 'We have an even newer 3D technology we're using on our next games. Most – if not all – of our future games will feature true 3D movement with six degrees of freedom. You can expect to see some of these in the first part of 1996.'

It's a measure of how fast videogames are moving that even before *Build* is finished, it's already obsolete.

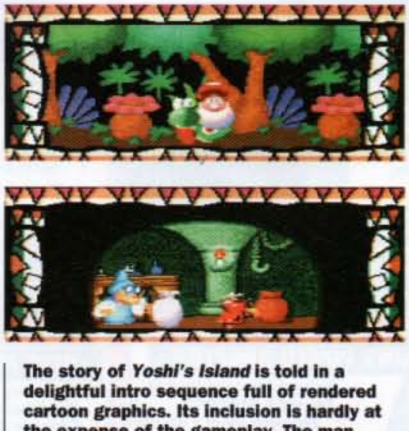


Yoshi's Island

Super Mario World 2

The history of videogames is littered with the corpses of platform characters who have tried to emulate the success of Nintendo's humble Brooklyn plumber turned games god. Now Nintendo has returned to the scene of its greatest triumph to show them how it's done. Again…





The story of *Yoshi's Island* is told in a delightful intro sequence full of rendered cartoon graphics. Its inclusion is hardly at the expense of the gameplay. The man behind *Yoshi's Island* (and the other *Mario* games), Nintendo's Shigeru Miyamoto (left)

Format:	**Super Famicom**
Publisher:	**Nintendo**
Developer:	**In-house**
Release date:	**August 7 (Japan)**
	October 2 (USA)

With a curious absence of the customary pre-release media hoo-hah, Nintendo has unveiled what is destined to be its biggest game of the year. *Yoshi's Island: Super Mario World 2* is the latest title in the hugely influential *Super Mario* series. Three years in development, it was actually all but finished last year, but this is the first time it has been seen in detail. **Edge** spoke exclusively to its designer, **Shigeru Miyamoto**, about the technology behind the game and the tweaks he has made to the familiar *Super Mario* gameplay.

As Miyamoto explains, in terms of gameplay and appearance, *Yoshi's Island* marks a subtle departure from *Super Mario World*: 'It's the same type of *Mario* action game but because the main character is Yoshi, many different tricks are available. For example, Yoshi can swallow the enemy, which results in a variety of interesting actions. And the way Yoshi jumps is different from the way Mario jumps. You will notice many differences from *Super Mario World* when you actually play it.'







World 1 (above) has six open and two hidden stages. Baby Mario is suspended in a bubble when he falls off Yoshi (top right)

'It's the same type of *Mario* action game, but you will notice many differences when you actually play it'



The story of *Yoshi's Island*

originates in the distant past of the fanciful Mario universe, just after the birth of twins Mario and Luigi. A stork rushing to deliver the babies to their parents has been waylaid by the Koopa wizard Kamek. Kamek had a vision that a baby would be delivered who would threaten the Koopa clan, and so he kidnaps Luigi. When he discovers that another baby is still at large, he orders the Koopas to find him.

Meanwhile, Baby Mario, clutching a map which shows where he should have been delivered, has landed right on the back of Yoshi as he walks around Yoshi's Island – an island full of Yoshis. The Yoshis decide to try and return Baby Mario to his parents in the Mushroom Kingdom, avoiding Kamek's traps and the Koopas' various minions. And so begins another *Mario* adventure.



A giant Bullet Bill cannonball, as featured in *SMW1*, hurtles from the back of the screen to the front – through the scenery (above)

Continued next page

In the game proper, Baby Mario is handed over to a new Yoshi escort whenever he gets to the end of a stage – a different Yoshi inhabits every stage of every world. Should Yoshi take a hit, Baby Mario falls off his back and floats around the screen in a bubble. Yoshi then has about nine seconds to reach him before a flock of evil vulture-like birds grabs him and spirits him away – ironically, in *Super Mario World* it was Yoshi who trotted offscreen if Mario was knocked off his back.

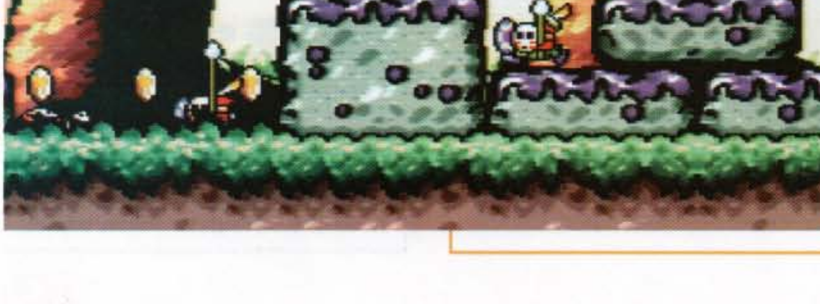
Baby Mario can leave Yoshi's back safely, but only if Yoshi collects a star. Then Mario becomes… Super Baby Mario, who, for a few seconds, can climb walls and fly with his cape – no doubt very useful for reaching some of those fiendishly concealed entrances to hidden levels. But it's Yoshi's game and his abilities are at the heart of much of Miyamoto's finely tuned game mechanics.

Yoshi has greater versatility than Mario had in *SMW*, although in many respects his controls and actions are similar. As before, Yoshi can jump on enemies to squash them, before eating them and spitting them out at other foes. But now he can also transform enemies into eggs, which he then spits out to activate power-ups (most of the secrets in the game can only be accessed this way), hit floating blocks or attack enemies. Different-coloured eggs have different properties: some turn into homing missiles, for example, while one even bursts Mario's bubble, returning him to Earth for Yoshi to pick up. When you prepare to fire an egg, a small target crosshair appears, which can be moved about the screen.





Yoshi aims and fires an egg at a flying power-up (above). Dodging spearchuckers in one of the game's forest levels (below)



'*Yoshi's Island* is 16Mbit, but the actual volume of the game is greater than other 16Mbit games. For example, more than 130 unique enemy characters appear'





While Yoshi turns into a helicopter, Baby Mario floats in a bubble (above). Waterfalls cascade down in the background (top)

Yoshi can fly a short distance through the air and dive at the ground, driving a stake into it. He can also transform himself into different modes of transport (something like the suit power-ups in *Super Mario Bros 3*), which give him access to areas he can't normally reach. After collecting the right item, Yoshi turns into a helicopter, a train or a submarine, while Mario tags along in a protective bubble. Still more variety is added by Yoshi's eggs, complete with baby Yoshis (the same ones that featured in the later levels of *SMW*).

In any other platform game, such details would be mere padding. But this is a *Mario* game, and, more importantly, a Shigeru Miyamoto game. It's hard to think

of any game from Miyamoto and his Nintendo teams that hasn't been groundbreaking, genre-stretching, immaculately conceived and perfectly executed. And while other game designers rush to embrace new 32bit systems, Miyamoto is proving that great games are still possible on more 'limited' machines.

'*Yoshi's Island* is 16Mbit,' Miyamoto told **Edge**, 'but you must realise that the actual volume of the game is bigger than other 16Mbit games. This is because the Super FX chip has allowed us greater compression. The map is smaller than that of *Super Mario World* but it's condensed, and there are more tricks in the game. For example, more than 130 types of different, unique enemy characters appear. Some of them appear only once, so don't miss them. Try as many of Yoshi's actions on each different character – some of them will surprise you as a result.'

The game is split into six worlds, each of which comprises 10 levels: eight 'open' levels and two 'hidden' ones, which are only revealed when Yoshi has collected every flower and coin on the first eight and completed them within a time limit. The resultant total of 60 levels is a lot less than *Super Mario World*'s 96, but with exits to up to five sub-levels on each main level, the final count could exceed 100.



Spot the Super FX² special effect as Yoshi and Baby Mario line up a jump onto a rotating hexagonal platform



Flames arc across a castle level (above). A single spotlight follows the duo, who also have two eggs tagging along (below)



'*Yoshi's Island* was created in terms of the potential capability of the Super FX chip'



The *Yoshi's Island* project was started some four years ago, at almost precisely the same time that development began on the Super FX chip. In fact, as Miyamoto reveals, '*Yoshi's Island* was created in terms of the potential capability of the Super FX chip, which enables moving objects to be rotated and zoomed.'

The results are spectacular: huge cannonballs fly from the back of the screen to the front, crashing through the scenery; polygon doors and drawbridges open out into the screen, entire playfields rotate, backgrounds shimmer and wiggle, platforms rotate in 3D, and gigantic bosses morph... It's an orgy of special effects.

The Super FX chip has also had a considerable influence on character design and placement. 'There are bigger enemy characters than in other SFC games, and more moving characters appear on screen at once because the chip is doing the calculations,' boasts Miyamoto.

Continued next page



In this water-filled level, the evil wizard Kamek soars overhead as Yoshi and Baby Mario come face to face with a frog

Continued

The graphics themselves are drawn in a new style, too. 'Although it's a digital technology generating the graphics, we wanted to realise images that had the warmth of a child's painting,' says Miyamoto. The familiar *Mario* 'look' is still evident, but the imprecise, sketchy finish lends *Yoshi's Island* an extra charm.

Another Miyamoto masterpiece? It's hard to believe otherwise. Even this, his fifth *Mario* game, is clearly as inventive and amusing as its predecessors. However, Miyamoto admits that it's getting harder to think up fresh ideas for the series: 'It was very difficult to create the sequel. That's why we made Yoshi the main character. By changing the main character, you could enjoy a variety of different actions.'

Asked why his competitors can't match *Mario*, he answers, 'I think they are simply trying to imitate the surface and not deeply considering why such a trick or action or other feature was chosen by us.'

So, just as almost everyone was dismissing the SNES and waiting for the Ultra 64, along comes a game that could expose the shallowness of most 32bit titles – besides outselling them by a large margin.



Miyamoto likes his ghosts – Yoshi runs away from an evil-looking Boo (above) and a huge, transparent wobbly phantom (below)







'I think our competitors are simply trying to imitate the surface and not deeply considering why such a trick or action was chosen by us'



Yoshi tries to snip a chain (top) and plays the card bonus game (above). Other bonus challenges include a scratch 'n' win game

And it won't be the SNES's last hurrah, either. When asked if *Yoshi's Island* would be his final SFC game, Miyamoto replies: 'No, I am currently working on several other SFC titles.'

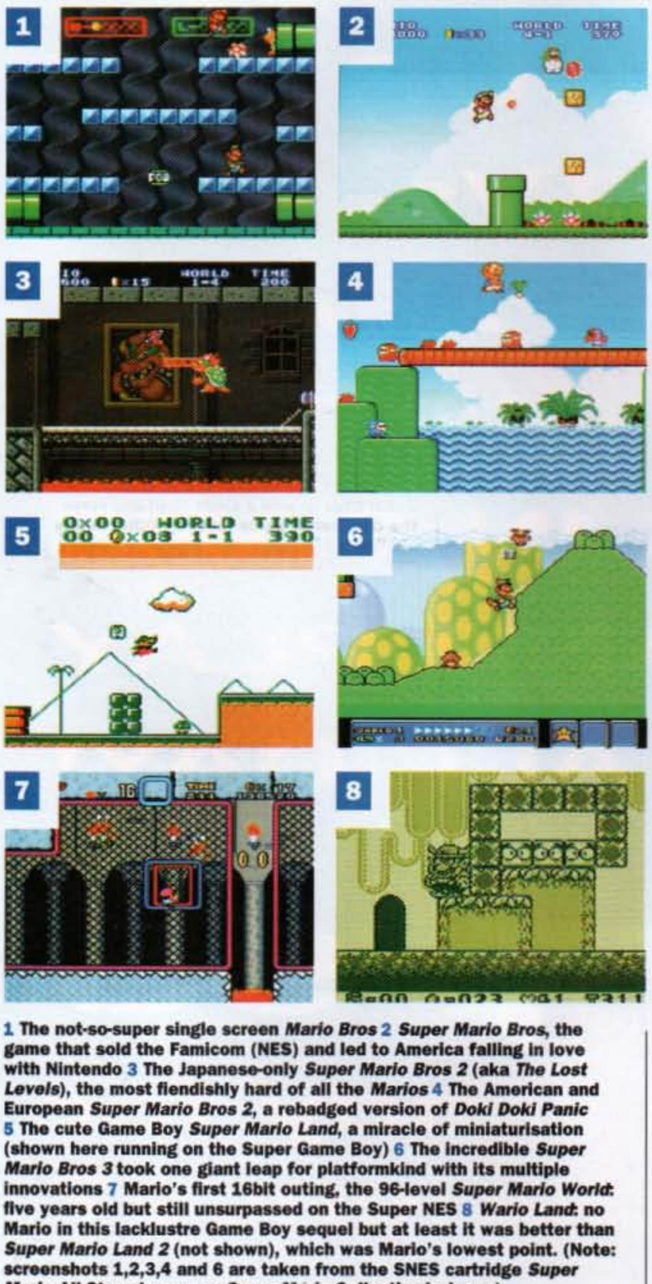
Gamers will no doubt be awaiting *Yoshi's Island* – and future Miyamoto games – with baited breath.

Mario sales

Super Mario Bros 1983/85	NES	**40 million**
Super Mario Bros 2 1988	NES	**10 million**
Super Mario Land 1989	Game Boy	**14 million**
Super Mario Bros 3 1990	NES	**17 million**
Super Mario World 1991	SNES	**18 million**
Super Mario Land 2 1992	Game Boy	**7 million**
Super Mario All-Stars 1993	SNES	**8 million**
Wario Land 1994	Game Boy	**3 million**
Total sales		**117 million**

Mario: plumbing the heights

Nintendo's success story is inextricably linked with the history of Mario. It was *Super Mario Bros* which defined the *Mario* games – and platform games in general from then on – and the classic elements remain unchanged to this day: huge, cunningly constructed levels, tortuous jumps, a wealth of different enemies, clever power-ups and countless secret areas and tricks to keep the game fresh for months. 117 million gamers can't be wrong…



1 The not-so-super single screen *Mario Bros* 2 *Super Mario Bros*, the game that sold the Famicom (NES) and led to America falling in love with Nintendo 3 The Japanese-only *Super Mario Bros 2* (aka *The Lost Levels*), the most fiendishly hard of all the *Marios* 4 The American and European *Super Mario Bros 2*, a rebadged version of *Doki Doki Panic* 5 The cute Game Boy *Super Mario Land*, a miracle of miniaturisation (shown here running on the Super Game Boy) 6 The incredible *Super Mario Bros 3* took one giant leap for platformkind with its multiple innovations 7 Mario's first 16bit outing, the 96-level *Super Mario World*: five years old but still unsurpassed on the Super NES 8 *Wario Land*: no Mario in this lacklustre Game Boy sequel but at least it was better than *Super Mario Land 2* (not shown), which was Mario's lowest point. (Note: screenshots 1,2,3,4 and 6 are taken from the SNES cartridge *Super Mario All-Stars*, known as *Super Mario Collection* in Japan)

Playing for **kicks**

What next for the football game?



Soccer sims are the undisputed champions of the computer sports league. But with polygons now becoming predominant, are the graphics dictating the gameplay? Edge looks at the past, present and future of the football game

If there's ever such a thing as an evergreen bestseller, able to transcend videogame fashions and remain in favour for years rather than months, it will surely be a football game. More popular than any other sports sims, football games inherit the simplicity and appeal of the real sport and often arouse the same passion and fanaticism.

But despite the enormous number of soccer titles produced, only a few have ever established themselves as giants, eclipsing the sales of other software on whatever format they appear by an enormous margin. The current champion, *Sensible Soccer*, has sold over 650,000 copies (the majority of those in Europe) across all its formats. Practically every company has released a football game at one time or another, but most fail to achieve the same success as *Sensible* and other outstanding games like *Kick Off* and *FIFA International Soccer*.

There's usually a constant flow of new football games, but when the World Cup comes around every four years a flood of official and unofficial titles fills the shelves, many of them obviously hasty cash-ins with little thought for gameplay or simulation. Two of the most infamous World Cup-inspired football games were US Gold's 1986 release, *World Cup Carnival* (a thinly disguised and vastly overpriced repackaging of Artic's 1983 game *World Cup*), and, following the Mexico competition, *Peter Shilton's Handball Maradona* (a licence hardly likely to persuade English fans to buy the game). The general quality of the World Cup bonanza improved in 1990 and 1994, but most of the titles remained merely timely shelf-fillers.

For many years the computer football field was dominated by the British, and it was in the UK that the genre's rigid forms and frequent minor innovations appeared. In 1982, Addictive's *Football Manager* (created by Kevin Toms) proved that there were sales in stats, but subsequent management sims, although successful, never attracted the same attention as action games. However, benchmark arcade titles emerged on a variety of different formats and became firm favourites with players and the software press alike.

On the Commodore 64, *International Soccer*, created by Andrew (*Ecstatica*) Spencer, was the clear winner. On the Spectrum, it was Ocean's *Match Day* and its sequels. As the home computer market upgraded to 16bit, the baton of footballing excellence was passed first to Anco's *Kick*

continued

Powersport Soccer
(PlayStation)







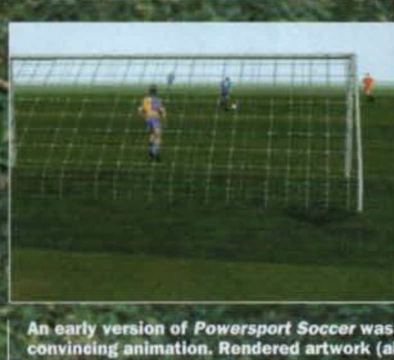
***Powersport Soccer* maintains the high graphical standards of Psygnosis' other PlayStation titles**

Psygnosis' ever-growing roster of forthcoming PlayStation titles includes *Powersport Soccer*, developed by the company's French studio, based in Paris. Motion-captured players and realtime texture-mapped 3D polygons are fast becoming de rigeur for 32-bit football games, and *Powersport Soccer* follows the trend.

The players – sampled at 100MHz and played back at 25MHz during the game – are arguably the best-looking of the new breed of motion-captured footballers, and there's an array of fixed and floating camera angles to show them off. Like Gremlin's *Actua Soccer*, Psygnosis used professional players as motion-capture models.

Three leagues from each of the major European nations – France, the United Kingdom, Italy, Germany and Spain – are promised, as well as the Champions' League and support for fourplayer link-up.







An early version of *Powersport Soccer* was recently shown at E³, revealing some smooth, convincing animation. Rendered artwork (above) will be reserved for the game's intro

Football games

J-League Winning Eleven (PlayStation)



Konami's J-League-licensed game features some oddly angular polygon players (above and right)





The heavy, lumbering players may look convincing, but the shadows don't

Konami's footballing pedigree was established with *International Superstar Soccer* on the SNES. The best original SNES footy game, it was also the first Japanese soccer title to really attract fans in the UK, topping the chart for four months. A fact which should make *J-League Winning Eleven* one of the PlayStation games to look out for.

Essentially an arcade game rather than a sim (the game also uses Konami's PlayStation coin-op board), *Winning Eleven* uses three buttons to kick, tackle, head and sprint. The shaded polygon players look more angular and more stylised than those in *Powersport Soccer* and *Actua Soccer*, but in common with both those titles, there's a very mobile camera which roams the pitch offering very tight-in over-the-shoulder shots, playable side-on views and ridiculous blimp views.

The UK version of *Winning Eleven* will be called *Goal Storm*.





A spot of goalmouth action in the crowded and slightly truncated penalty area (left). The giant close-up views look good but their contribution to playability is still in doubt (right)

Off games and then to *Sensible Soccer*. 'When we were developing *Megalomania* we played *Kick Off* for a year, and that's what inspired us to do *Sensi*,' recalls Sensible's **Jon Hare**. The small, simple graphics of *Kick Off* and *Sensible Soccer* were truly functional – their size and the size of the pitch were crucial in determining how the rest of the game worked. Appearance was second to gameplay, and that's how it should be, maintains Hare: 'Playability is head and shoulders above anything else. That's the control system, basically. Endlessly tinkering with it until it's right.'

Enter the SNES and the Mega Drive, and enter the Japanese and the North Americans. In Japan, football games had been in the arcades for years, but the restrictions of the arcade environment and a lack of any real understanding of the sport meant that they were often unplayable and frequently disregarded the basic rules of football. However, a growing interest in the sport prompted slightly more realistic, more playable games. Human's *Formation Soccer* on the PC Engine (and later the SNES, as *Super Soccer*) was the pick of the bunch, although it was still clearly inferior to its British competitors.

In America, EA – with its mind on World Cup USA '94 – set about creating a football game that would emulate the success of its other sports titles, *PGA Tour Golf*, *John Madden Football* and *NHL Hockey*. The task fell to EA Canada (formerly Distinctive Software) and, surprisingly, to a football fan. **Bruce MacMillan**, executive producer of EA's *FIFA* line, was determined to innovate: 'The industry got into a bit of a gridlock about how sports sims were done. I think that when we did the first *FIFA* we looked at the state of the industry and how sports games were perceived, and we felt we could do something new.'

It's true that until *FIFA International Soccer*, the cosmetics of football games were not impressive – but then they didn't need to be. However, the crisp isometric graphics and swelling crowd sounds of *FIFA* on the Mega Drive were central to what MacMillan wanted to capture about the sport. 'When we sat down and designed the first *FIFA*, we said to the development team, sit in the 20th row at Wembley and feel the atmosphere. It's almost Gothic. I said we must capture that audio element. European football is an emotional experience and we wanted that.'

FIFA was indeed groundbreaking, but it wasn't without its critics – the idiosyncratic



***Sensible Soccer* (PC version shown): still arguably the finest Amiga game in any genre and still the best-playing football title**

control system and isometric viewpoint disappointed many.

'*FIFA* looks good and sounds good. I think that's the difference between a console product and a computer product,' reasons Sensible's Jon Hare. 'I don't think console gamers like small graphics. With consoles, the gameplay doesn't need to be there. You're dealing with a younger public who don't care if a game's out of fashion and isn't played in a couple of months.'

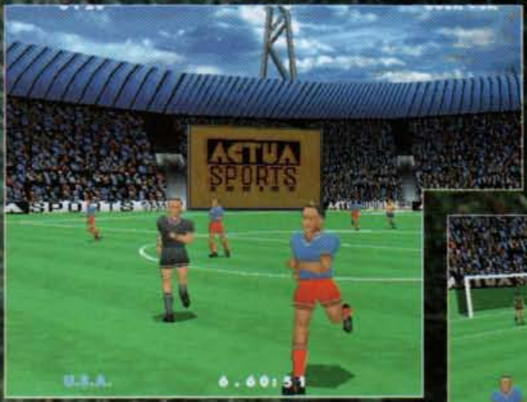
Arcade, console and computer games all have different agendas. But if the history of football games proves anything, it's that gameplay is what sells, not graphics. All that may be about to change, however, as a new wave of football games about to hit 32bit consoles and high-end PCs looks set to change the face of the genre forever.

It was another console version of *FIFA*, EA's ground-up reworking of the game on the 3DO, that really propelled the football game into the next generation. 'We were wondering what would happen if you moved the camera,' muses MacMillan. 'It was a huge step forward for us, and, in a small way, for the industry, to prove that 3D sports sims could work.'

The swooping, sweeping game camera in *FIFA* 3DO was a beacon for other developers and coincided with the emergence of the PlayStation and the Saturn, consoles capable of handling complex 3D polygons and, indeed, sold on those abilities. The result of this match-up was a rush of polygon football games, all sharing similar graphics, camera systems and approaches to the sport.

The next incarnation of *FIFA*, the '96 edition, builds on the foundations of *FIFA* 3DO. It's being originated on the PC but is destined for simultaneous release on six formats, including PC, Saturn and PlayStation. Also being developed on the PC is Gremlin's *Actua Soccer*, which has at its heart the motion-captured moves of professional players (notably Sheffield

Actua Soccer (PC)







The texture-mapped SVGA players in *Actua Soccer* have a staggering 120 different moves

Until now, Gremlin's experience in football games has largely been confined to strategy and management sims – its *Premier Manager* series is a consistent bestseller on the PC. But with *Actua Soccer* (also due for the PlayStation), the Sheffield company is moving into new territory.

Gremlin has used its new $250,000 motion-capture studio to record 120 moves for the goalkeepers, outfield players and officials, using professional footballers as models. This should give *Actua Soccer*'s players a very realistic feel. 'There are little subtle movements that motion capture picks up that a normal graphic artist wouldn't,' explains producer **Tony Casson**.

Actua Soccer is the first football game to use motion capture on such a grand scale. 'We're pretty proud of this,' says Casson. 'I think this is the next step and everyone else will be playing catch-up. Over the next few years there will be a lot of motion-captured games.'

If successful, *Actua Soccer* will pave the way for a series of *Actua* sports games from Gremlin, all boasting motion-captured players and virtual stadiums.









Four of the game's camera set-ups: the wire cam (top right); zooming in towards the ball's-eye view (top left and above right); out wide with the manual cam (above left)

FIFA International Soccer '96 (PC)





From the stands (left) or from over the pitch (above), *FIFA '96*'s camera is always 'interactive'



A combination of motion capture and traditional animation was used for *FIFA*

What began as *EA Soccer* on the Mega Drive has gone on to become one of Electronic Arts' most lucrative series. The latest version is being developed by EA Canada, which is building on the experience it gained producing the innovative *FIFA* 3DO.

Developed on the PC (as was the original isometric version), *FIFA '96* doesn't use pure motion capture for its player animation. As producer Bruce MacMillan explains, 'the more motion you capture, the more lush the visuals but the slower the gameplay experience.'

To get around this, EA opted for a hybrid of motion capture and classical animation. It took certain motion-captured frames and then created 'tweens' to animate between them – a technique much closer to rotoscoping than motion capture.

FIFA International Soccer '96 is designed to be playable on a 486DX2/66 but it's unlikely that the SVGA mode will run at an acceptable speed on anything less than a Pentium – par for the course with most high-end PC games these days, unfortunately.

Wednesday's Chris Woods and Andy Sinton) and a virtual stadium just as versatile as *FIFA*'s.

'We're doing just about everything we can with the camera,' explains *Actua*'s producer, **Tony Casson**. 'We've got positions fixed to the traditional *Kick Off/Sensible* views, but we've also got several other angles and a "wire" view where you can go wherever you want. You can play from any player's view and even from the referee's.'

Giant polygon players and mobile cameras are unquestionably impressive, but many people have yet to be convinced that gameplay isn't being sacrificed for the sake of graphics. 'You can only sweep the camera so far before you disorientate the player,' argues Jon Hare. 'The best games for 3D sports are fighting games. They're close contact and you can have big graphics but still see the whole thing. The same principle could be applied to soccer, but for most games you need to have a greater, more tactical view.' And such a wide view won't, of course, look as attractive as the closer views in polygon beat 'em ups and, arguably, won't attract as many punters.

Combining polygon players and dynamic cameras without compromising the play of the game is a fine art, and those developers working on 3D football are aware of the difficulties. '*FIFA* 3DO taught us that there are two types of camera,' says Bruce Macmillan. 'There are interactive cameras that give you enough information to make gameplay decisions, and TV cameras that look very good but are difficult to play from.'

Tony Casson agrees. His team at Gremlin developed *Actua Soccer* from the inside out. 'We first made the *Actua* football engine and then started on the look of the game. We had the intelligence of the guys, with basic graphics on a basic pitch, and then we put in the 3D graphics.'

The large players introduce their own set of problems. Quite simply, the bigger





Accurate leagues from around the world – including the English Premier League (left) – will give *FIFA '96* a depth its predecessors lacked. The Jumbotron scoreboard (right)



The game that pushed football graphics from the functional towards the fabulous: *FIFA International Soccer* on the Mega Drive



EA's *FIFA* 3DO, developed by EA Canada, was the first football game to successfully fuse polygon graphics with a dynamic camera

they are, the more detail you need to put in to make them believable. The basic graphics of *Sensible Soccer* simply had a running animation for the players, one frame of which was used for kicking, shooting and passing. In a polygon-based game, not only do the individual moves have to look realistic but the animation between each one should be convincing. It's something Tony Casson encountered while producing *Actua Soccer*. "One of the problems we've had with the players is, say, when there's a cross, deciding whether a player would go for a normal header, a low header or try to kick the ball."

Perhaps the most significant development for football games isn't the virtual stadium or motion-captured players but the J-League. Japan's first professional league bought in foreign talent and within a few years established a large, fanatical following for the sport. Football games are now high on the agenda for Japanese developers, and they haven't been slow to harness the potential of the 32bit machines.

Sega has already produced the attractive if disappointing *Victory Goal* and has another polygon-based soccer game heading for the Saturn. And Konami's *J-League Winning Eleven* is another Japanese game about to make an impact on the football market. The Japanese still seem biased towards basic arcade games, but as the J-League continues to grow in popularity, a demand for greater realism will surely follow, which can only make for better designed games.

Football, regarded by many as a metaphor for life, is also the prime example of the ongoing struggle between style and substance, graphics and gameplay. It's inevitable that 3D will supersede 2D in football games, but the precise nature of those games is harder to predict. One thing is for certain, though: the games that attract the most fans and sell the most will be those which blend the basics of control, simplicity and tactical versatility with today's modish polygon graphics.

And the rest...

1 

2 

3 

4 

5 

1 Rage's long-serving *Striker* makes its 3DO debut 2 Human's PlayStation title, *Hyper Formation Soccer*, continues the series and is one of the few 32bit titles to eschew polygon graphics in favour of some neatly animated scaling sprites 3 Konami's *International Superstar Soccer Deluxe*, a Super NES sequel to the original chart-topping hit 4 UBI Soft's humorous (and, some might say, laughable) *Action Soccer* 5 Namco's *J-League Prime Goal '95* is another PlayStation polygon-based game, but (in this shot, at least) its camera use appears less cosmetic than in other titles

1 

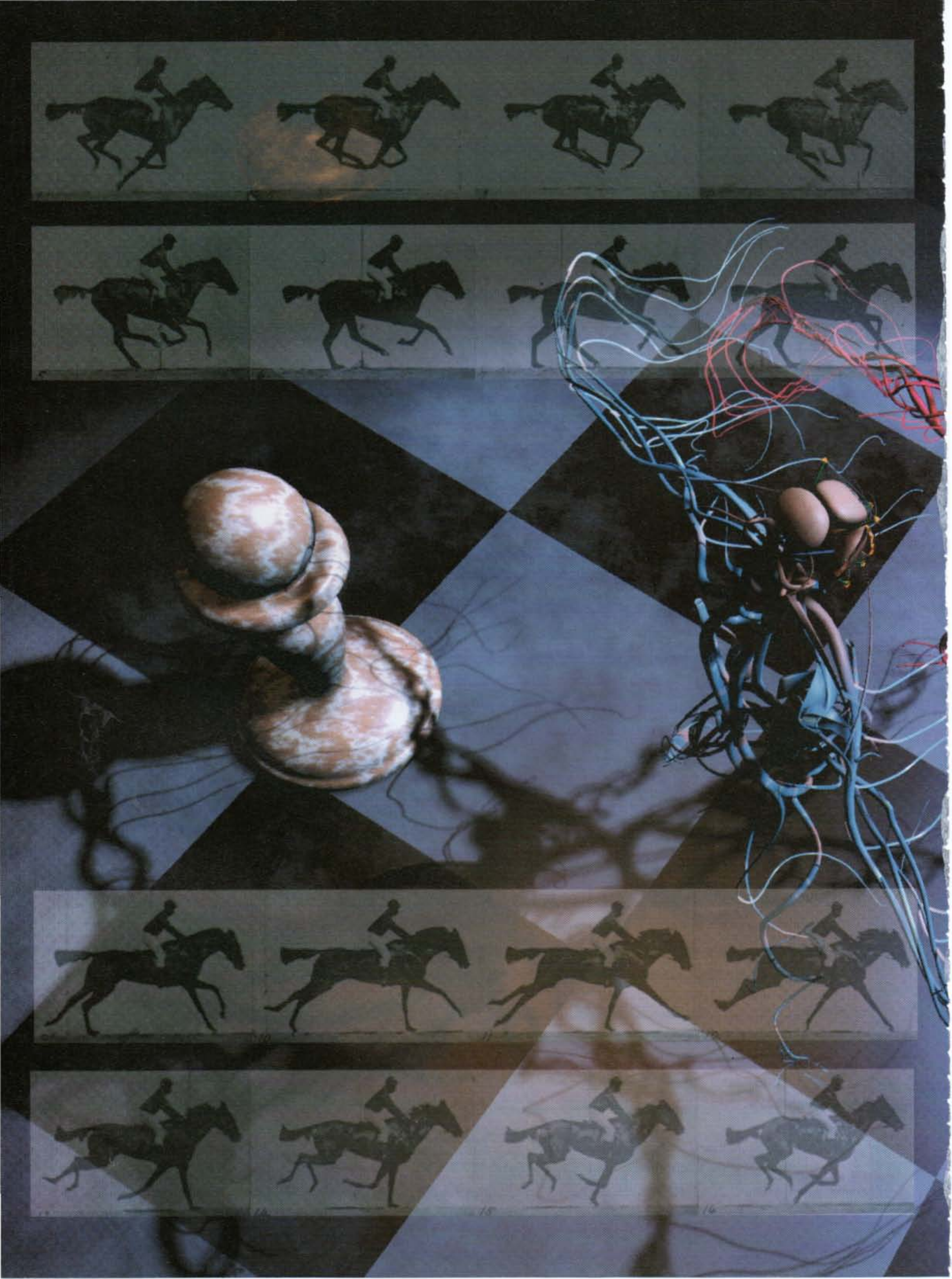
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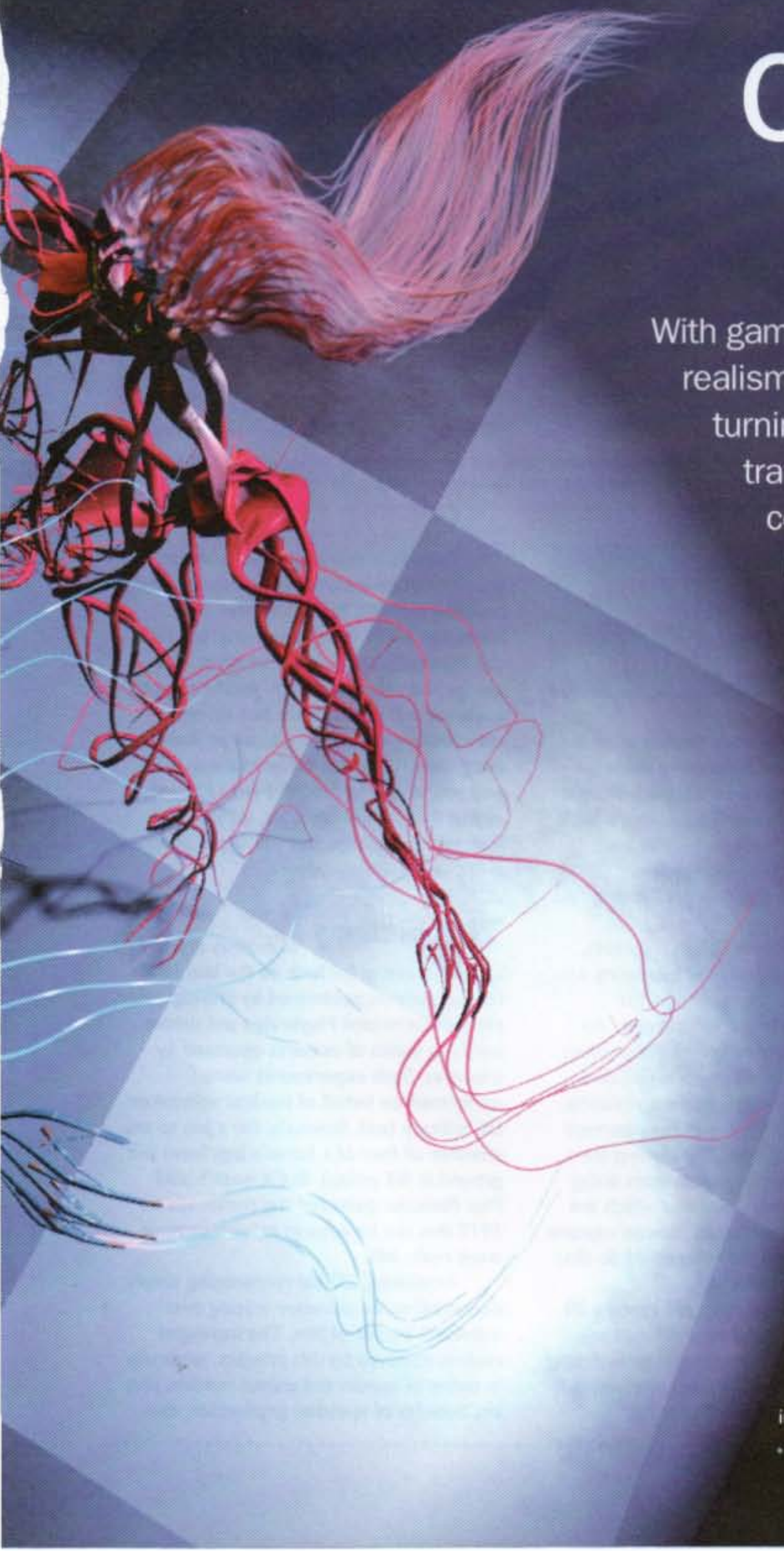
5 

4 

1 SNES title *Total Football*, from Domark via Acclaim, marks the return to football games of veteran developer Jon (*Match Day*) Ritman 2 *Total Football*'s game camera is particularly versatile, considering the limitations of the 16bit machine 3 Epoch's *Excite Stage '95*, a perfect example of a lightweight SFC soccer sim 4 Sega's latest arcade heavyweight, *Virtua Striker*, which seems to have a graphical advantage over every other football title 5 *International Victory Goal* on the Saturn was disappointing, but another Saturn football game is on the way



Motion capture



With gamers demanding ever-greater levels of realism, more and more developers are turning to motion capture – the science of translating real-world movement into computer animation. **Edge** examines the latest technology in this fast-moving and increasingly important field

As the graphics capabilities of domestic hardware have improved, traditional 3D animation techniques have been found increasingly wanting. Character animation has always been one of the biggest obstacles in the generation of convincing graphics; despite huge increases in processing power, more advanced rendering techniques and all the other weapons in the computer animator's armoury, natural movement has remained an elusive goal.

Dean LeCoe, of American motion capture systems manufacturer Motion Analysis, puts his finger on the problem: 'You could draw an interesting environment – say a city street and give it an atmosphere. You could put the lights in, you could put in the shading, you could make something very realistic. But when you tried to walk a person through that you lost any sense of realism because, probably deep in our primitive brain, we can watch a person walk from a great distance and tell instinctively whether they're young or old, healthy or unhealthy.'

This is because, of all the visual information received by the brain, it's movement that is processed first, ahead of both form and colour. It's a survival instinct left over from our existence as a hunter/gatherer, and a fundamental part of our genetic make-up. It's also very difficult to fool.

Despite advances in the 1980s such as the inclusion of hierarchical skeletal systems in animation software and the introduction of inverse kinematics (where joints are set up as

Motion capture

control points which the animator uses to determine movement), 3D computer animation of human motion has never quite managed to be convincing. Which is why an increasing number of leading-edge games companies are now turning to motion capture, where a performer's movement is translated into raw data and then ported it into an animation package. The technology enables developers to create computer character animation that is more fluid and more realistic than anything that can be achieved with any other system.

Realism is the key. 'You can hold the illusion, the suspension of disbelief, longer if the character moves realistically,' comments **Carl Swanick** of Lore Design, whose *Highlander* is one of a range of new games using motion capture techniques to impart greater realism to animation.

These games include current sensations such as *Tekken*, as well as forthcoming titles like Acclaim's *Alien Trilogy*, Gremlin's *Actua Soccer*, and Psygnosis' *Powersport Soccer*. But the number of games employing the technology is by no means representative of the amount of attention the industry is showing



A typical optical set-up. First, highly reflective balls are attached to set points on the subject. Strobe lights then play over the capture area and sensors record the movement of the balls

'There's an almost overwhelming interest in motion capture. There aren't that many people using it yet, but the interest is certainly there'

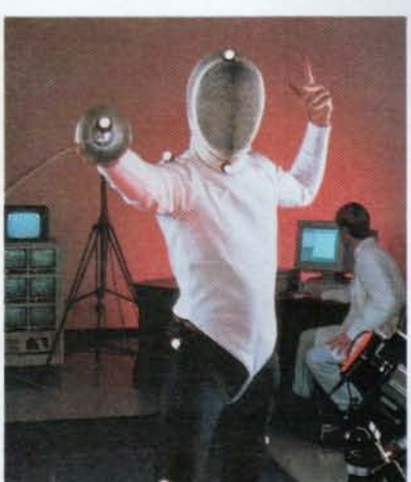
to the field. 'We only started venturing into it in the past six months,' says **Pete Meddings** of Oxford Metrics (which has already sold one of its Vicon 370 optical systems to Probe Entertainment), 'but there's an almost overwhelming interest in it. There aren't that many people using it yet, but the interest is certainly there.'

'Games seems to be a big driver right now,' agrees Ascension Technology's **Jack Scully**, 'although the people who are making the animations for movies, television and commercials are holding their own.'

Apart from the benefits to realism, another crucial factor in the increasing use of the technology is its potential for speeding up the production process. As games get more complex and the graphics more demanding, anything that facilitates the character animation phase is welcome.

LeCoe again: 'We've seen customers who are collecting over 1000 moves for a game – and this is many characters doing many different moves, some of which are unique to single characters. Motion capture is probably the only way you could do that in a reasonable timeframe.'

Medding agrees. 'You can capture 30 or 40 moves in a day. I don't know how long it takes people to animate or keyframe things to the same quality, but my feeling is that it must take longer than a day.'



23 markers is regarded as the minimum needed to accurately capture human motion

Swanick is more cautious, pointing out that it's not an instantaneous solution and coupling the data set to the desired animation is still time consuming, but he still concludes that it's a time saver. 'It's swings and roundabouts. A good computer animator will probably do one or two animations a day, while we can probably get away with 10, so it is faster in a way. The way you've got to mould them all together makes them more complex, so you can lose your advantage. But you'll still produce more with motion capture.'

The history of motion capture

can be traced as far back as the late 1800s, to experiments performed by photographic pioneer Eadweard Muybridge and others involving banks of cameras operated by tripwires. Such experiments were performed on behalf of medical science or the military (and, famously, for a bet to see whether all four of a horse's legs leave the ground at full gallop). But it wasn't until Max Fleischer patented the rotoscope in 1917 that the benefits of motion capture were really felt.

Traditional 2D cel rotoscoping simply depended on an animator tracing over individual frames of film. The increased realism achieved by this process, especially in terms of human and animal motion, plus the benefits of speedier production, saw

the method being increasingly used by animation studios such as the Fleischer Brothers and Disney towards the middle of the century.

By the time the pioneering years of computer graphics had been reached in the late 1970s and early 1980s, a lot of the methods used for character animation were still derived from 2D rotoscoping. Moreover, they were still highly labour intensive, involving either projecting video images onto a computer screen to pose a character's keyframes, or manually encoding points on a 3D model.

All current methods of motion capture rely on markers being placed on a performer's joints. Once motion has been filmed or analysed, a data set is produced to interpret that movement into Cartesian co-ordinates (xyz positions), which provide the spatial location of each of those markers. This information is then cleaned up if necessary and ported into one of the major animation packages, typically Alias, Wavefront or SoftImage.

One of the earliest ways of capturing human motion and applying it directly to a 3D model involved prosthetic devices strapped onto the performer's body. A series of armatures were connected by both rotational encoders placed at the joints and linear encoders placed along the limb. Although this results in an exceptionally clean realtime data set, the physical problems of performing in what amounts to an exo-skeleton have severely curtailed its use.

Another method, which looks like becoming an evolutionary dead-end, is based on acoustics. Three receivers are arranged in a triangle around the capture space, with audio transmitters strapped to the performer's body (again, at the joints). The transmitters are then sequentially triggered to produce a sound, with the receivers calculating the time it takes for each signal to reach them and triangulating a point in space for each marker.

Magnetic systems

The genealogy of magnetic motion capture is military, with systems such as Ascension Technology's Flock Of Birds and Polhemus' Fasttrack derived from magnetic tracking sensors developed for installation in aviation head-mounted displays.

The way they work is very similar to acoustic systems, although here the receivers are placed on the joint positions of the body and measure positional and orientational data with respect to a transmitting antenna producing a pulsed DC signal. The Flock transmitter consists of a core about which the x, y and z antennae are wound, concentrically, while the receiver comprises three orthogonal antennae sensitive to DC magnetic fields.



Magnetic motion capture is relatively cheap, but the wires inhibit movement

In operation, initially all transmitting antennae are shut down, enabling the receivers to measure the x, y and z co-ordinates of the earth's magnetic field. Then the x, y and z transmitter antennae are fired up sequentially, with the receivers measuring the values along all three of their axis. This results in 12 measured values per receiver per cycle, with a differential amplifier automatically subtracting the measured component of the Earth's magnetic field from the receiver values. Each receiver can make up to 144 measurements per second and the unit can track up to 30 of them simultaneously.

As Ascension's Jack Scully points out, it's a system with many advantages: 'It puts out a field that is not blocked or occluded if there is some obstruction between its receiver and transmitter. As long as that body is not metallic we don't lose any data. The other big advantage is that the animator and director can see in realtime how a session went. They can see a wireframe on a screen and they can review it from there. The third advantage is the fact that the magnetic system is probably a quarter of the price of the optical one.'

While price is, of course, an important consideration, magnetic systems do have their drawbacks. Probably the main one is the cabling necessary to link every single receiver to the transmitter, which effectively precludes fast action takes. Also, any metal in the vicinity can cause ferrous interference, producing unwanted spikes in the data. The capture area is also quite small – the Flock can only capture in a 16-foot hemisphere.

This problem can be surmounted using zoning. 'You can really cover a room with a second transmitter,' says Scully. 'Only one will be on at a time, and an actor will either be in close





Actors' movements are transformed into slick animations: a US TV ad for Monopoly (top) and a rapping skeleton (above)

proximity to transmitter A or B, not both simultaneously. So if he walks out of the range of transmitter A, we turn it off and turn B on so he keeps on going.'

Despite the slower capture rate, the realtime delivery is impressive. The lag, defined as the time difference between the start of a physical rotation of the receiver and the start of the output of its correct measurement, is a mere 8.5ms for position and orientation measurements and an even faster 4ms for angular output.

Continued

The main drawbacks are that the resulting data set is not collected simultaneously and that the capture area is limited by the speed of sound. Echoes cause additional problems, the sampling rate is limited and the performer is hampered by the cabling necessary for the system's operation.

The two pre-eminent capture systems at the moment are magnetic (see page 61) and optical (see page 63). The magnetic system suffers from the same tethering problem as the acoustic one (as well as from the possibility of ferrous interference) but its relatively low cost and ability to produce realtime data ensure its continued survival. Optical systems use multiple cameras to track reflective markers. Although they're expensive, and there are problems with occlusion of the markers, they've had a great impact on the industry because of their tetherless operation, high-speed capture ability (up to 240fps) and potential for multiple simultaneous captures.









Delphine's *Flashback* used rotoscoping, while Sega's *Virtua Fighter* (left), Namco's *Tekken* (right) and Lore Design's *Highlander* all employ modern motion capture techniques

Traditionally,

motion capture has recorded positional data, simply translating the positions of markers into 3D spatial co-ordinates. The resulting data is then used to drive the control points of an inverse kinematic skeleton through a loose coupling arrangement. Loose coupling was found to be necessary because the markers were only monitoring the way the skin was behaving in motion, not the actual joint itself, and the correlation between the marker's motion and the desired motion of the skeletal joint was sometimes rather wayward. Therefore, the data set was only allowed to influence the skeleton, each joint of which had to be placed under certain constraints.

Accepted wisdom is that 23 markers is the minimum for human animation. '23 or 25,' says Swanick. 'You can probably get away with one less on the head, but the thing is, you want to define all your angles and your movements as easily as possible and not have to worry about it or have massive points to attach the model to. 23 without a proper ankle/toe arrangement, 25 with a proper one.'

Once you get to that point, though, the amount of 3D data being recorded starts to get rather unwieldy, and it becomes much easier to simply store the data set as a series of bone rotations around the skeleton's various joints.

Rotational data, such as that used in the Acclaim system (see page 65), new Motion Analysis software, and the Vicon 370, is also more accurate than simply tracking joint positions, leading to far more fluid animation. It's automatically derived from positional data using biomechanical algorithms and then ported into animation software where the angular motion between a performer's body segments (typically numbering in the 20s and roughly analogous to the human skeleton) can be directly used to drive a body segment model. From there, if need be, it can be massaged using inverse kinematic solutions.

'Capturing the data has actually become less of a challenge,' says LeCoe. 'The systems are pretty well understood, the marker sets are understood, and our optical system can give you a lot of detailed, clean displacement data. The problem was, when you tried to move the displacement data over to animations you ran into scaling and inverse kinematic issues. Now we're releasing rotational output so you can get from our system either displacement or body segment orientations. The filters are being put in place by Wavefront, Alias and SoftImage, so suddenly the 3D animators are going to have an easier time.'

Dean LeCoe

suggests that motion capture is now growing up. If the diffusion of rotational approaches into turnkey packages marks the end of puberty, other developments are going to catapult it into fully fledged adulthood.

Although magnetic motion capture seems to be gradually diminishing into obsolescence, it would be wrong to regard optical systems as their natural successor. In some senses, especially considering the price differential, they are complementary technologies rather than competing ones. As Jack Scully says: 'A couple of our customers, at Sega, for instance, use the magnetic tracker for their everyday quick and dirty work and then, when they want to do some high-speed manoeuvres like martial arts, they'll go to an optical one.'

'Sega, for instance, uses the magnetic tracker for quick-and-dirty work, but for high-speed manoeuvres they'll go to an optical one'

Development in both disciplines continues. 'One of the complaints about the magnetic system has been the large number of cables and wires and power

Optical systems

Optical motion capture has a different heritage to magnetic systems, originating in biological science labs as a tool to study flow dynamics. Its use in the entertainment industry is comparatively recent, with Dean LeCoe dating it to a radical shake up in the industry about two years ago.

'It was less of an invention and more of a convergence,' he says, 'between Silicon Graphic computers that had visual display capabilities and software including Wavefront, SoftImage and Alias which mortals could actually run.'

Optical set-ups, such as Motion Analysis' ExpertVision HiRes 3D system, are not cheap, routinely costing three to four times more than magnetic capture technology. The principle is simple: an array of high-resolution cameras equipped with strobed LED on-axis lighting sources tracks directionally reflective balls attached to the performer. The raw data is then trigonometrically analysed in proprietary software and a stream of 3D spatial co-ordinates or rotational data produced.

Despite its cost, optical motion capture has developed steadily due to its advantage over magnetic technology. To start with, it's tetherless, allowing unrestricted movement for the performers over a capture area currently pushing 20x20 feet. Coupled with a sample rate of around 240fps at the high end, it's ideal for capturing fast action, both for the entertainment industry and for biomechanical studies in the professional sports field. It can also currently track up to 100 markers, allowing the possibility of multiple simultaneous captures.

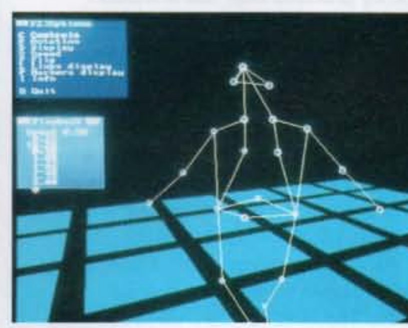


The downside is the risk of ghost markers (if the cameras are misaligned), scaling problems, calibration difficulties, and processing time. 3D optical motion capture is also not yet quite a realtime process, though 2D facial capture systems based on the technology now are. Probably the most serious problem, though, is occlusion.

'If you fall over onto the floor and you block a marker you'll lose it because the cameras can't see it,' explains Swanick. 'But saying that, you only lose it for a short period of time, a fraction of the take, and you can do some processing – curve analysis and curve repairs – to regain it.'











Sheffield-based Gremlin Interactive is one of the first UK software houses to establish a motion capture studio, using Motion Analysis' HiRes System. Sheffield Wednesday footballer Chris Woods' movements were captured (centre, centre left) for inclusion in Gremlin's forthcoming *Actua Soccer*. Gremlin's studio has already been used by other companies, notably for the recent 'virtual reality' television ad for Kit Kat

Motion capture

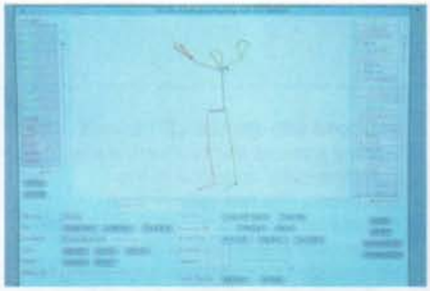
supplies,' says Scully. 'From this summer you will see all of the cords and wires ending up in a single user-friendly chassis. That will have a user-friendly interface on the front and interfaces to the host computer via SCSI or Ethernet, probably an RS485, so the user will be able to pick which interface he wants to use and send the data right on to his SGI computer.'

In the optical camp, the current goal is to increase the size of the capture area. Although Motion Analysis' capture area is approaching 20x20ft, the push is on for even greater volume. The limiting factor, though, is the resolution of the cameras. If the cameras view a marker as less than a pixel in size, the data produced is going to be nowhere near accurate enough for smooth animation.

High-definition cameras are easing onto the market, but their high cost (around the $15,000 to $20,000 mark) currently prohibits their use in motion capture. That will change, and with the current breakthroughs taking place in HDTV, they should deliver a whole new magnitude of resolution capability. Add to that the migration of technology from ranging satellites into the field and it's a reasonable assumption that in a couple of years' time motion capture will be operating in football-sized stadiums.

As well as increasing the capture area, there's another hurdle waiting to be cleared. 'The next frontier,' says LeCoe, 'is multiple-character simultaneous capture – and don't let anybody tell you it's easy. First you saw things like the Acclaim promotion, where you had two people with guns walk into the area separated by five or six feet. The next leap forward was that Motion Analysis did some kick boxing stuff, and to do that interaction with all the physics and neurology of it by keyframe is almost impossible. If you capture the kinetics of the people you get a much better result. Now we're trying to get to where people grapple with each other and you can still peel them apart, and that takes a lot of intelligent tracking and tools.'

It's probably not too far off, though. When people talk about progress in motion capture they tend to speak in terms of months rather than years. With the industry on the verge of Plug & Play, more and more character animation is going to be up to the standard of the likes of *Alien Trilogy*. However, other developments in complementary technology will soon make even that apex seem primitive.





Data processing is a crucial part of motion capture. Data is displayed in stick form for easy manipulation. Points that have been obscured can be corrected and other details added

There's a great future in game interfaces where the player's motion is captured – bringing more of yourself into cyberspace

One of those developments is full-body scanning. Cyberware recently rolled out the WB2 and WB4, both of which are capable of a full-colour scan of an object in a capture area 2m by 1.2m. The scanners use up to four lasers to triangulate depth based on reflected light and can complete a whole body scan in about 12 seconds. The results are impressive, producing a single-skin model ready for direct porting into animation packages. Although the technology isn't cheap (the WB4 is around £300,000) the USAF is known to have acquired one, and there are rumours that Acclaim has taken the same route.

But fluid character animation may well prove to be one of the least impressive of motion capture's by-products. Some of the technology arose out of tracking systems for HMDs, and many people are now starting to talk about it returning to its roots and throwing up VR applications.

'I think motion capture is going to move into a more personal realm,' opines LeCoe. 'There's a great future in, for example, game interfaces where the motion of the players themselves is captured, allowing them to transcend having to twitch fingers to press buttons and pull joysticks and instead physically participating in the game – bringing more of yourself into cyberspace.' **E**





Image reated by **Chris Landreth** using Alias *PowerAnimator*



Cyberware's full body scanner (top right). A facial scanner was used to capture the data for this 3D portrait (left). Facial markers can be used to capture human expressions in realtime (right)

The Acclaim approach

Earlier this year, **Edge** was invited to visit Acclaim's motion capture studio, a gymnasium-sized set-up located in the basement of the company's spacious HQ in sleepy Glen Cove, New York.

The studio is dominated by the main capturing stage, which is 59 feet long, 43 feet wide and 24 feet high. There's also a smaller scanning room, used to capture facial expressions and small hand movements. Although specifically set up for head scanning, it's currently being converted for body scanning and close capturing. Acclaim will eventually be able to put as many as 300 sensors on an actor's face to record facial animation and lip-sync.

Because Acclaim uses optical technology, the main stage is completely clad in black rubber. The cameras are high-res, rigid-mounted units, custom-made by TI. Acclaim's proprietary system comprises four black-and-white capturing cameras plus two slaves, used by the director to assess the performance.

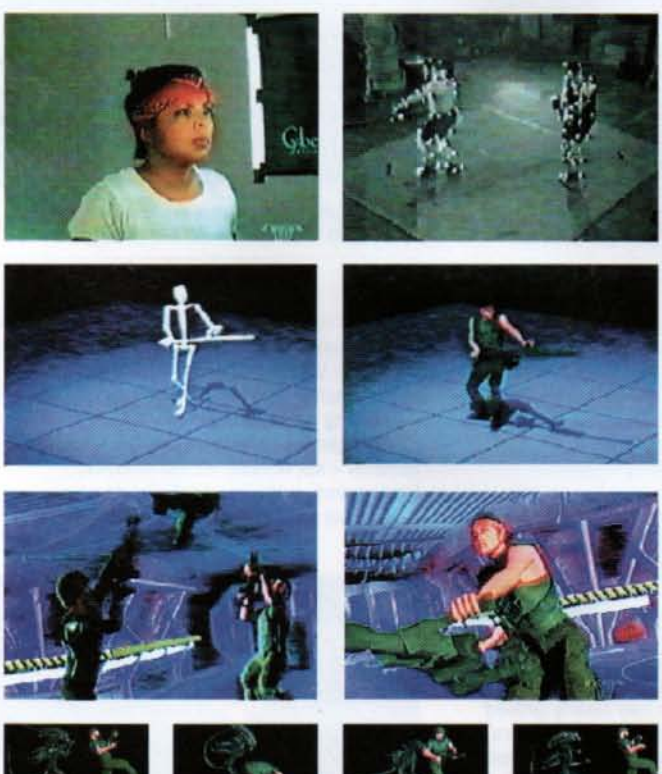
The capturing process itself is fairly straightforward. Performers don black suits featuring an adjustable number of rubber sensors (from 10 to 150), each of which has a ball of Scotchlite tape at its end to reflect light back to the source. Capturing begins with a video shoot, after which each camera's output is digitised simultaneously to create a raw point file. Proprietary biomechanical algorithms are then applied to produce the bone rotation data.

As Acclaim's **Wes Trager** attests, bone rotation has many advantages: 'It gives us really high-resolution character animation. What we did was to create a new format for the skeleton and the motion data to drive the skeleton, and then have the industry adopt these formats so that our customers have an easy means of getting their data into their particular software package.'

These algorithms are clearly the key to Acclaim's highly realistic end product. Gamers will be able to see how they perform in a gaming environment with the release of *Frank Thomas 'Big Hurt' Baseball* and the much talked-about *Alien Trilogy*.



Acclaim's games make use of both motion capture and bluescreen techniques



Acclaim's forthcoming *Alien Trilogy*. First, Vasques' face is scanned and some basic sweeping movements captured optically. This data forms the basis for a wireframe model, to which textures are then added

Terminal Velocity

Format: PC
Publisher: US Gold
Developer: Apogee/ 3D Realms
Price: £40
Release: Out now





***Terminal Velocity*'s 3D engine moves at a blistering pace. The subtle misting effect plus the low-level targets make for a real edge-of-the-seat experience. It all adds up to the perfect environment for a multiplayer game**





The boss of the ice world is a giant cruiser (bottom) which lurks around a curious building made up of four huge slabs (middle)

Utter the words 'PC space flight sim' and the chances are most people will think of the involved and involving LucasArts sims *X-Wing* and *TIE Fighter*, or Origin's movie wannabe *Wing Commander* series. The choice is between precision simulation and cut-scene extravaganza; there's nothing for anyone seeking arcade gameplay or an accessible space dogfight. Enter Apogee's *Terminal Velocity*, a game which blends design aspects of *Descent*, *Magic Carpet* and, inevitably, *Doom* with an impressive graphics engine developed by Mark Randel (who was responsible for the hugely popular *Flight Simulator 5* engine).

The experience Randel gained on Microsoft's evergreen sim has clearly proved invaluable, because *Terminal Velocity* offers the most convincing sensation of high-speed, low-level flight yet on the PC. The thrilling ground rush is only enhanced by the misting which limits your out-of-cockpit visibility – and also conveniently limits the amount of graphics the PC has to shift. As with far too many PC titles, you need a beast of a machine to experience *Terminal Velocity* at its best, but the basic VGA mode with reduced textures is still attractive and runs fast enough to be both convincing and exciting.

The game is set on a variety of dramatic terrains – ice worlds, hellish volcanic landscapes, water-covered worlds and cavernous valleys. Littering each world are



One of the 'race' levels. Fly down the valley, crossing checkpoints, to reach the level goal



The boss you come across at the end of world five is a gigantic lava monster, which emerges menacingly from an obviously still very active volcano



Terminal Velocity's tunnel sequences are reminiscent of *Descent*. Some tunnels open out into giant chambers in which a boss resides and all of them are replete with power-ups

bases, armouries, gun emplacements and radar sites – you usually have to destroy all of them to complete the level.

Each level is also riddled with tunnels (some with hidden entrances), which are strikingly similar to those in *Descent* and filled with the usual range of opening and closing doors, spinning sections and occasional foes. Enemy intelligence isn't bad – try to hide above the clouds and the smaller fighters pursue you, repeatedly attempting to get on your tail. The final level of each of the six three-stage worlds has a boss – a giant ship or installation – just begging to be destroyed.

It's hardly the most complex of tasks, and *Terminal Velocity* is arguably nothing more than a glorified shoot 'em up – albeit a pretty glorious glorified shoot 'em up. Some levels are structured like races, with a number of checkpoints that have be reached before you can leave the level, but by and large, your sole duty is to shoot everything in sight.

Terminal Velocity is simple without being unrefined, and instantly gratifying without lacking longevity. But its greatest strength is its fast-paced action. The *Doom*-led transformation of the PC from pedestrian sim/strat/adventure machine into arcade powerhouse has hit some kind of frenzied, frenetic peak here. Like *Doom*, the sheer thrill of just playing pulls you back – the sensation of flight and the buzz of combat are that good. And, also like *Doom*, there's a superb multiplayer mode where up to eight pilots can dogfight each other. Probably the best network game since *Doom*, *Terminal Velocity* proves that there's still plenty of mileage in 3D flyers on the PC.



The large, pixelly graphics and basic lasers may look uninspiring, but the speed is the key here



The snowbound stages of *Terminal Velocity* are unsophisticated but the most fun to fly over

Edge rating: **Eight** out of **ten**





Cruising over the surface of a barren, airless world (top). Tearing through a tunnel at breakneck speed can feel like the stargate sequences in *2001* (above)

Super Sidekicks 3

Format:	Neo-Geo CD
Publisher:	SNK
Developer:	In-house
Price:	£60
Release:	Out now (Japan)





***SS3*'s expansive pitch is covered well by the panning and zooming game camera. Player animation is good and there's plenty of humour and instant playability – it could only be a Neo-Geo game**







The basics of *Super Sidekicks 3* are very similar to those of its immediate predecessor: smooth scrolling arcade action, big close-ups and a tough competition mode

SNK's *Super Sidekicks 3* is a staunch disciple of the Japanese arcade school of football. It exhibits a cheery disregard for some of the basics of the game and sacrifices many details to ensure a fast and exciting kickabout. Like its predecessors, it's a blast rather than a simulation, but it's none the less enjoyable for that.

Cosmetically, it's one of the best football games around. The side-on pitch scrolls and zooms smoothly and the hefty players throw themselves about with gusto. All of *SS2*'s close-up views and picture screens have been transferred and their giant graphics prove that soccer games don't need motion-captured polygon players to look impressive.

The close-up views cut in for events like penalties, direct free kicks and 'Chance' shots (when a player has a go from outside the box), giving you a small crosshair with which to aim at the net. *SS3* also introduces a completely new view: when a player gets one-on-one with the goalie, there's an up-the-pitch view of the penalty area as the striker tries to round the 'keeper or shoot past him.

There are still plenty of things to annoy the ardent football fan or anyone more used to European computer football. For instance, the teams still don't change ends at half-time and players walk through each other all the time, but *SS3* is simple, playable and – like an uncanny number of Neo-Geo games – just plain fun.

Edge rating: **Six** out of **ten**





Victory for Brazil in the final leads to some typically over-the-top Neo-Geo celebrations

Ace Combat

Format: PlayStation
Manufacturer: Namco
Developer: In-house
Price: ¥5800 (£45)
Release: Out now (Japan)











Ace Combat is one of the first games to use the PlayStation's hi-res mode (top). Choose your mission (middle) and hire a wingman (above)





Most of the time in *Ace Combat* you're left chasing tiny white target boxes around the sky. When the planes do appear close-up they look good, though

Nothing highlights the differences between consoles and the PC more than flight sims. PC sims are frequently criticised for their painfully slow learning curves and impenetrable 300-page manuals. In contrast, arcade sims are often accused of shallow gameplay, instant kicks and next to no longterm challenge. Unfortunately, *Ace Combat* is true to type.

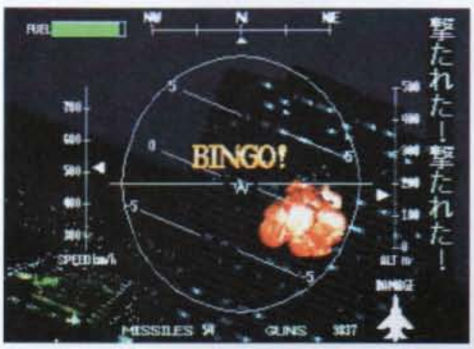
The game's coin-op origins (it was called *Air Combat* in the arcades) become apparent after a few minutes' play. The controls are basic (up, down, left, right, gun, missile and afterburner), and any game with a simple control system needs involving gameplay if it's to avoid appearing superficial. However, *Ace Combat* is decidedly lightweight.

It's a shame, because the attention to detail in the pre-mission briefings is more than adequate, and the 3D engine is up to the job. Before each mission, a pompous-sounding Japlish voice elaborates on your task, while graphics and extra stats are flashed up over various strategic points. Each successfully completed mission earns you money, which can be used to hire wingmen for the trickier tasks and buy more expensive – and therefore more powerful – planes.

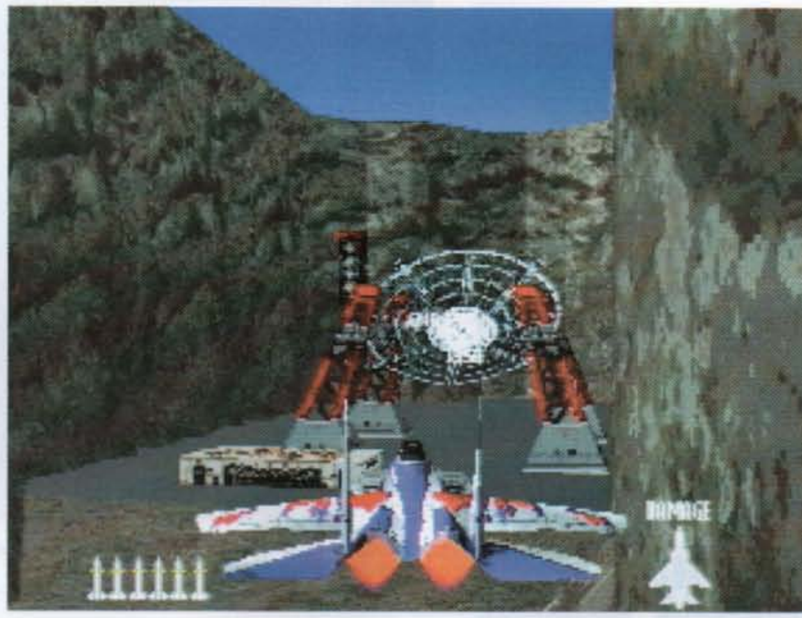
But it's the missions themselves which let the game down. They're just dull. They consist of chasing a little white target box around the sky, hitting the afterburner to close the distance and loosing off a trio of missiles (you need three hits to down any air target). You then hear a sample ('Bingo' if you hit and 'Jesus, missed' if you didn't), a weedy explosion ensues, and the plane proceeds to fall out of the sky. Repeat a few times and return to base. It's not exactly an action-packed experience. Missions with ground targets are even more tedious, since buildings tend not to take evasive action.







Ace Combat's scenery is less than inspiring. The desert levels (top) feature monotonous pale sand with occasional buildings. The city (above) is best, but it's a shame everything has to be so dark



Ace Combat never set out to be a profound game, but whereas in the arcades it provided the short-term thrills required, in the home it turns out to be a deeply soporific experience. There's simply not enough variety for extended play – no chaff or flares to chuck out, no scenery to play with. And although each plane has different stats, the F4 and Eurofighter 2000 seem to possess virtually identical aerodynamics, reducing longevity still further. The twoplayer mode could have redeemed the game, but two aircraft flying blind in a restricted area for a couple of minutes doesn't make for exciting competition.

The scenery is much blander than it should have been, consisting largely of plain expanses of land and sea spiced up by the occasional spectacular bridge and blocky explosion. The city levels are the most impressive, with buildings drifting past slowly and smoothly, but even here it seems as if Namco has deliberately avoided putting any more onscreen than was absolutely necessary.

With *Ridge Racer*, *Cybersled*, *Tekken* and now *Ace Combat*, Namco seems to have settled into a schedule of alternate alpha and beta releases. Although *Ace Combat* isn't as tragic as *Cybersled*, it's certainly not worthy of comparison with *Tekken* and *Ridge Racer*. Still, if Namco adheres to this strategy, it should make buying decisions easier. **E**

Edge rating: **Five** out of **ten**



There are 20 missions in the game. At the end, you encounter this flying fortress (top cluster, top row). Twoplayer mode (top cluster, bottom row) is a waste of time. This canyon level (main) is over in the space of a minute. Stop this big crane destroying the environment (above)





Throughout the game, explosions are weedy and rarely seen up close (top). Although the missions vary (in one, you have to attack these docks, above), tactics are always identical

FX Fighter

Format:	PC
Publisher:	Philips/GTE
Developer:	Argonaut Software
Price:	£45
Release:	Out now



The fighters rarely appear truly solid in *FX Fighter* – limbs and joints often look unconvincing











The hogwash that passes as a plot involves alien superbeings getting together to determine who is the strongest. The loser of each fight sacrifices his/her/its planet (top)





Even with the detail set at maximum, the graphics offer nothing to really drop jaws

Argonaut gave itself one of the toughest tasks possible when it set out to produce a game in the mould of *Virtua Fighter* and *Toh Shin Den*. Both were groundbreaking titles which introduced significant innovations in terms of graphics as well as gameplay in a 3D environment.

With Argonaut able to call upon its own much-lauded *BRender* technology, it was unlikely that the visuals would be a major stumbling block (a PC game running in VGA will never match the sharper resolutions of either the Saturn or PlayStation, but at least the component parts can be approximated fairly convincingly). No, it was in the transferral of that indefinable magic known as gameplay where hiccups, if any, would be evident.

And hiccups there are. Sega's and Namco's games felt sharp, but *FX Fighter* is a much woollier experience. The main problem is the clunky control system, which means that it takes a long time to get into the game. Even with a two-button joypad – the most effective method of control – *FX Fighter* is a pale imitation of the benchmark titles.

But perhaps the game's most frustrating weakness is that it doesn't introduce any new ideas. Instead, it cribs disparate elements from its rivals and melds them into an unsatisfactory whole. Whereas the quest to beat *Virtua Fighter* resulted in *Toh Shin Den*'s projectile attacks and *Tekken*'s unique control system based on individual arms and legs, *FX*







The Bay level (top) is one of the most impressive. The game's two female characters in action (above)



At the start of the bout, the game 'camera' swings around and into the arena (top left). Although derivative, the *Virtua Fighter/Tekken*-style views are well implemented

Fighter has nothing (save perhaps some impressive 'proper' 3D backdrops) to set it apart and give it any discernible personality of its own.

The forte of Japanese game designers is their ability to create strong, instantly appealing, durable characters. And just as very few Western platform stars have been able to give Sonic or Mario a run for their money over the years, the *FX Fighter* combatants fall limply at the feet of their opposite numbers in *Virtua Fighter*, *Tekken* and *Toh Shin Den*. The decision to give them all otherworldly characteristics (each character has his/her own home planet which they defend in the tournament) dramatically limits their appeal. Magnon, for example, is a big, ugly lump of rock – hardly the stuff of kids' posters.

The characters' heads not only lack a sense of solidity but they seem to be only loosely attached to their respective torsos. In fact, you get the impression that a particularly violent blow would knock them clean off their shoulders. Comical, yes, but hardly conducive to credible gameplay. And like *Fight For Life* on the Jaguar, the fighters' faces are made up of relatively flat surfaces, resulting in a strange mask-like appearance. Polygon break-up during character movement doesn't exactly help matters either.

This lack of realism is also apparent in the way the characters interact with each other. On occasion, a combatant supposedly in the throes of being throttled will be making a terrible fuss when there's quite patently no connection being made at all.

Polygon clipping, that bugbear of all complex fast-action 3D games, is far from perfect too. When a fighter is knocked out of the ring, the camera rises to provide an overhead view of the scene. Unfortunately, when this happens the character partly merges with the ring, sometimes even disappearing altogether. Flaws like this imply a rushed development schedule – possibly in order to ensure that the game cashes in on the still buoyant 3D beat 'em up trend.

Ironically, although it can't compete with its state-of-the-art console rivals, *FX Fighter* is accomplished enough to be the best beat 'em up on the PC and will probably fly off the shelves. If Argonaut had coupled its *BRender* technology with new ideas and sharper gameplay, the game would be more deserving of that success.

Edge rating: **Six** out of **ten**



The fighters present themselves for selection (left). Two bosses are unselectable from startup. Note the numerous *Virtua Fighter* touches (other pictures)

Virtua Fighter Remix





Format:	Saturn
Publisher:	Sega
Developer:	AM2
Price:	¥3400 (£25)
Release:	Out now (Jap)




***Virtua Fighter Remix* proves that the Saturn can handle texture-mapped polygons, allowing more detailed arena surfaces (top row) and embellishment of the characters' costumes, bodies and faces**



The *VF Remix* player-select screen replaces the polygon heads of *VF* with artistic portraits of the fighters

Virtua Fighter, the game that kickstarted the Saturn's career, still ranks as the console's finest title. *Virtua Fighter Remix* is basically the same game with a lot more texture mapping, a few new jingles and an almost complete absence of glitches.

Yu Suzuki and his AM2 team have successfully cleared up the niggles that marred the original and probably created the game they intended to before the rush towards the Saturn's Japanese launch severely curtailed its development time.

The flat, unshaded, largely untextured polygons of *Virtua Fighter* have been replaced by resplendent texture-mapped fighters who look as if they belong in *Virtua Fighter 2*. Lau is the most impressive, boasting a finely detailed face and an intricately patterned shirt, but all the characters look marvellous.

VF Remix is polished and playable, but the fact that Sega had to go back to the drawing board at all raises a few questions. Is the game an apology for rushing out the original, or a response to Namco's PlayStation title, *Tekken*? Whatever the case, *VF Remix* proves that the Saturn is capable of greater things when programmed intelligently. And that bodes well for AM2's conversion of *VF2*.




At a distance or in close-up, the texture mapping in *Virtua Fighter Remix* is wonderfully detailed

Edge rating: **Nine** out of **ten**

Shin Shinobi Den

Format: Saturn
Publisher: Sega
Developer: In-house
Price: ¥4800 (£36)
Release: Out now (Japan)





Jump over the spikes and avoid the falling platform (top). These mine carts take you inexorably to your doom (middle). Invoke the mystic powers of this chap to aid your quest (above). It's all standard stuff



Three enemies employ swarm tactics on the first level. All suffer a similar eviscerating fate



***Shin Shinobi Den*'s character animation is poor-quality and rapidly becomes repetitive**

After Nintendo, Sega is arguably the world's leading producer of platform games. But you wouldn't know it after playing *Shin Shinobi Den*.

This should have been the definitive game in the much-loved and highly respected *Shinobi* series. The Saturn's sprite-shunting capabilities have been proven beyond doubt by the likes of *Clockwork Knight*, and *SSD* would have been the ideal testing ground for some spectacular graphics. Instead Sega has opted for a highly conservative update of the game, devoid of innovative effects and all the added gameplay they could have brought with them. *SSD* is a 16bit game in the age of 32bit consoles. It simply won't cut it.

It's all a question of originality. *SSD* is a sideways-scrolling platformer, with a boss at the end of each stage and a toughie in the middle. Rocks fall from the ceiling, spikes rise from the floor and there are holes to jump over. The central character has four or five moves. And there's a stage featuring, yes, a mine cart. This is all classic platformer material, but a company like Sega has the ability – even, some would say, the duty – to take the genre into new territory.

The gameplay is woefully inadequate. Sho simply runs and jumps around, brandishing his sword, and the enemies consist of a few dodgily digitised Orientals with assorted sticks and shirukens. They appear at predictable moments, possess neanderthal intelligence











This dinosaur's head, which drifts across the screen, is a prime candidate for the worst effect ever seen in a videogame. Hit it three times and it shuts its eyes and disappears, only to reappear later. The level one boss departs in a puff of green smoke (top left). Mount Fuji provides the backdrop for level two (top right). Level three features a spinning imp (right middle). Level four has a swirly background (above right)

levels and die by queuing up meekly to be sliced in in half.

In any action game, especially a platformer, it's essential to be able to react to events and avoid the injurious consequences. In the later levels, *SSD* breaks this golden rule. Foes plummet down on Sho without any warning, making your reactions redundant. Mine carts reach a precipice at the end of the track and, rather than fall off, explode without warning, throwing you into the appallingly 'animated' water (and, although you're a Ninja trained to kill on sight, there's no question of being able to swim. No, it's concrete jacket time and back to the start of the level).

The sound is pitiful, too – a motley collection of beeps, whistles and flamethrowing noises. The Saturn's sound capability is reckoned to be more sophisticated than that of any other console, and yet this is all Sega could manage?

So, does *SSD* have any redeeming features? Well, the sprite rotation is smooth and the backgrounds are displayed in thousands of colours – something the Mega Drive couldn't have managed. But even this is a mixed blessing, because the parallax is amateurish and unconvincing. And although Sega has gone to considerable lengths to create a credible storyline, the result is shoddy Cinepak footage reminiscent of the worst efforts of the Hong Kong film industry.

Shin Shinobi Den is a waste of a game. It would barely be acceptable on the 16bit machines, let alone a £400 next-gen console. It's flawed in every department, and although the overall game is somehow not as bad as its individual components, you'd never play it for more than a few hours.

Edge rating: **Four** out of **ten**



Pre-rendered footage is used as an intro and between the stages. It catalogues a tragic tale of kidnapping and vengeance

Edge steps back in time to check out another chronologically challenged classic which changed the face of videogames history

Oids

Format:	ST, Mac
Publisher:	Mirrorsoft
Developer:	FTL
Price:	£20
Players:	One
Released:	1988





The mothership makes an appearance at the beginning (above). It's possible take out enemies by shooting through the teleports (above right)

In many ways, the release of *Oids* heralded the advent of the 16bit era. In mid-1988, many ST and Amiga games were simply upgrades of old 8bit titles. But *Oids*, with its extremely detailed graphics, had an intricacy and depth which marked it out as part of a new generation – and signalled the start of a golden age for the 16bit computers. And the fact that its creator, FTL, released its classic RPG *Dungeon Master* at the same time assured the San Diego outfit of almost legendary status.

Oids was essentially a shoot 'em up. It adopted the finer points of inertia-based space games such as *Thrust* and introduced more adrenaline in the form of fast-paced blasting action. The basic premise of the game was to cross five galaxies, penetrating mining complexes, destroying enemy factories and rescuing the tiny men (the eponymous 'Oids') trapped inside. The objective was then to get them back to the mothership intact – something that proved incredibly difficult.





The perilously narrow caverns (connected by teleports) leave little margin for error. A satisfying but unproductive technique is to shoot the Oids instead of rescuing them (above, right)



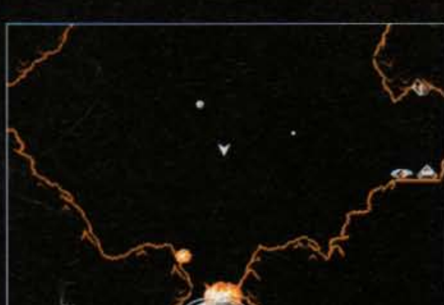
Like *Thrust*, *Oids* relied on disorientating inertia to provide the bulk of its challenge. However, instead of having to transport pods which caused your craft to sway from side to side, you faced enemy installations which distorted gravity and generally created havoc. The sheer weight of enemy fire power, coupled with a confusing teleport system, made it an extremely exacting game. In fact, only the most keyboard dexterous had a hope of mastering the later levels.

Although it failed to make the same impact as its atmospheric roleplaying cousin, *Oids* managed to command a fair degree of respect, thanks to its diminutive, perfectly formed sprites, detailed animation and hefty challenge (plus a construction set for creating your own planets). Well worth hunting out. **E**





Destroying factories (top) releases Oids, which you then pick up (above)



Volcano bases are among the most lethal enemy installations. A few bombs should do the trick

An audience with...



Hiroshi Imanishi

Photographs: Antonio Pagnotta da Fonseca

Once described as a 'Rottweiler', the PR manager of NCL has been a pugnacious defender of Nintendo's interests for several decades. Now, in the teeth of widespread allegations that the firm has lost the plot, he tells Edge why he reckons Nintendo has got it right



Hiroshi Imanishi is one of Nintendo's longest-serving employees. After working in several departments (finance, administration and planning) while the company was still primarily a manufacturer of playing cards, he was given the task in 1969 of creating a new department called Games. He went on to oversee the development of Nintendo's Ultra range of toys, including the Ultra Hand, the Ultra Machine (an indoor baseball pitcher) and the Love Tester.

As the right-hand man of Nintendo chairman Hiroshi Yamauchi, Imanishi presided over many of his boss's special projects, including Nintendo's first forays into the arcades, the Game 'n' Watch series and the marketing of the original Famicom in 1983. He was later responsible (with Yamauchi) for Operation Midnight Shipping – the clandestine Japanese shipout of the SFC on November 20, 1990.

As the general manager of NCL's PR department, Imanishi is effectively the public face of Nintendo in Japan. **Edge** quizzed him about the current state of the company and its vision of the future.

Edge Nintendo is now a huge multinational corporation. How many of its employees are actually based in Japan?

Hiroshi Imanishi We employ around 960 people in Japan, but the majority of our staff are based abroad. In total, Nintendo employs 2599 staff.

Edge How is Nintendo structured?

HI The biggest part of the company is the production division, followed by sales and administration. Research and development is part of the production division and is dominated by designers and hardware engineers rather than programmers. Coding is sometimes done by people outside Nintendo in conjunction with Nintendo staff.

Edge Is Nintendo now exclusively a videogames company?

HI No, we still also produce playing cards, but it now represents less than one per cent of our total sales.

Edge Is Nintendo-branded hardware produced by Nintendo alone?

HI Planning and R&D are solely Nintendo's responsibility, but other companies are sometimes involved in the assembly.

Edge In the past, Nintendo has ventured into the arcade business. Is this a field you intend to explore further?

HI Nintendo has produced some arcade games, but our involvement was limited to the software. The arcade business requires

a lot of investment. If we made a *Mario Bros* coin-op, at ¥100 a play, we would have to wait a long time for it to be profitable. Nintendo is not interested in products where profitability is linked to the length of playing time. We want to make products where time is not a restriction – for example, a home console that a consumer can buy cheaply, with lots of software. And, of course, it's not enough to just make software for coin-ops – a good coin-op depends on a combination of software and hardware. Arcade consumers are also not the same as console consumers. Coin-op play can be considered a kind of mania. Console consumers are different.

Edge What about *Cruis'n USA*? In Japan the Nintendo logo appears on the coin-op…

HI We wanted to conduct some tests. The game is intended to demonstrate the capabilities of the Ultra 64. Williams was wholly responsible for the coin-op and licensed the rights to Nintendo. Nintendo was not involved in producing the game at all. In Japan, Taito is Williams' official dealer, so it is possible to find a few coin-ops. But, Nintendo didn't have anything to do with it.

Edge What are your views on the current 32bit market?

HI According to the mass media, the 32bit war began last year in Japan. A lot has already been said about the 32bit market, even about the Ultra 64. But in fact there is no war at all. In Japan, the only platform to have more than 11 million units on the market is the Super Famicom. Forthcoming games such as *Seiken Densetsu 3* [*Secret Of Mana 2*], which is going to be released in September, will surely achieve sales of more than two million cartridges. *Donkey Kong Country* had sold 2.6 million as of March, and *Dragon Quest* and a new Mario game [*Yoshi's Island*] are going to be released this year. This year, the Super Famicom market is unique.

Edge Which company does Nintendo regard as its most dangerous competitor for the Ultra 64: Sega or Sony?

HI We could say that because 64 is bigger than 32, the Ultra 64 will have no rival hardware! [Laughs.] In Japan, with 90 per cent of the current market, Nintendo does not have any rivals. At any rate, Nintendo does not have any rivals for the hardware, but as far as software is concerned, our rivals are the licensees.

'There is no 32bit war at all. In Japan, the only console to have more than 11 million units on the market is the Super Famicom'

Edge Nintendo's unwillingness to adopt CD-ROM is well-known. So what is the best storage medium in your view?

HI We regard the ROM cartridge as the best storage medium, because of the hardware extension possibilities – DSP chips, for example. We really believe in this format, even for the Ultra 64. A greater storage capacity doesn't automatically result in better games – *Donkey Kong Country* is just 32Mbits, although Ultra 64 games will be bigger. CD-ROM has received a lot of publicity, but producing a CD game requires lots of energy and investment. Development times for CD-ROM games are also higher.



Edge Is Nintendo developing new data compression techniques to increase the storage capacity of cartridges?

HI Yes, we are working on new techniques in cooperation with SGI and component makers in places like Taiwan. The Ultra 64's compression techniques are different to those of the Super Famicom.

Edge What will happen to the Super Famicom when the Ultra 64 is released?

HI We think the Super Famicom will be as successful as it has always been. Ultra 64 developers will produce different types of games to those available for the Super Famicom.



Edge When are you going to officially announce the Ultra 64's specifications?

HI We don't intend to hold a press conference like we did with the Game Boy and Super Famicom. There's no need, because initially Nintendo won't be inviting thirdparties to produce games. First we want to prove the Ultra 64's capabilities with in-house software. Thirdparty contracts will come later. Sony and Matsushita pushed thirdparties to begin to produce games before the release of the hardware – these companies even assist some thirdparties financially. This is absurd. Sony had made more than 200 contracts with thirdparties by the time the PlayStation was launched. If the hardware is not good and does not sell, what happens to the developers? It is very risky.

Edge Will Nintendo exercise strict control over which companies are allowed to develop games for the Ultra 64?

HI We have set up a licence system for



Continued next page

interview

thirdparties, but we're asking them to wait a little while before developing for Nintendo. The hardware isn't proven yet. We have the Dream Team to demonstrate the possibilities of the Ultra 64, and if their games sell we will introduce our licensing system. We haven't signed any contracts with thirdparties yet. Moreover, some people have asked us not to release the hardware this year because we are still in the Famicom era. At the moment, plenty of good games are being released, and 16 bits are enough for the time being. Maybe in Japan the Ultra 64's main competitor will be the Super Famicom! [Laughs.] This year *Dragon Quest* will sell more than two million cartridges.

Edge What kind of development times can we expect to see for Ultra 64 games?

HI It is difficult to say because there are many different kinds of games and few thirdparties. But I would say around a year and a half.

Edge Does Nintendo have any multimedia aspirations for the Ultra 64?

HI No. The Ultra 64 is a games machine first and foremost.

Edge What do you consider to be the Ultra 64's strengths in marketing terms?

HI If you're talking about specifications – number of colours, speed, etc – that means nothing to us. If you can't see the game moving on the screen, you can't judge the hardware. The human eye is the best judge of a good game. And for good games we trust Mr Miyamoto…

Edge Who is responsible for the Ultra 64, NCL or Nintendo Of America? And how far advanced is hardware development?

HI Nintendo Japan initiated the project, and the hardware is developing rapidly. The main processing unit and maths PROM are finished and the hardware is now able to perform calculations. As far as the games are concerned, we will market them when we're satisfied with their quality. Unlike our competitors, we don't want to release any software which is not completely finished and satisfactory. Everybody is saying that we are late, but first we want to release some good software. We want to produce better games than our principal rival, the Super Famicom. Ultra 64 games will be even better than *Dragon Quest* or *Donkey Kong*.

Edge How much software will actually be available when the Ultra 64 is released?





'Ultra 64 will have no rival hardware. With 90 per cent of the current market in Japan, Nintendo does not have any rivals'



HI Three titles will be available, all of them from Nintendo. The prices won't be that different to the price of Super Famicom cartridges. We plan to release three games a month. Like the Saturn's *Virtua Fighter* and Sony's *Toh Shin Den* or *Ridge Racer*, we need to have some leading software. *Super Donkey Kong* sold 500,000 units the first day, and we are confident that the first Ultra 64 games will perform equally well. Sony has less software. The only major piece of software that Sony should have released was *Tekken*. *Toh Shin Den*, *Virtua Fighter* and *Tekken* are essentially by the same team. Sega's team left Sega and went to develop games for Sony. All of those games are essentially the same, apart from *Virtua Fighter 2*.

Edge Which Nintendo game has achieved the greatest sales in Japan to date?

HI *Mario Bros* is our biggest seller. *Super Mario Kart* also sold fairly well – 3,320,000 units. *Mario World* has been packaged with the hardware, and by the end of 1994 we had sold 3,220,000 units. *Super Donkey Kong* has sold 2,500,000 cartridges in a few months. Neither the Saturn nor Playstation can match these figures.

Edge Nintendo recently announced the launch of the Satellaview system. Why did you choose satellite rather than cable?

HI Firstly, we wanted to become involved in the media field to get in touch with as many people as possible. Moreover, we needed cheap hardware or it would have been impossible for us to reach this large audience. With 11 million Super Famicoms and around eight million satellite aerials in Japan, satellite seemed a good solution. The satellite adaptor is not very cumbersome or expensive. Cable covers a smaller geographical area than satellite, and cable users are less numerous in Japan, while satellite covers all of the country, not just urban areas. Cable also costs more than satellite. And more technical problems can occur with cable. Sega is mainly using cable TV for software, with profits coming from the cable TV company and hardware manufacturers. With CATV, consumers obtain software at a reduced price. They only have to download the game. Distributors don't benefit from the games at all. Nintendo can't use such a system. If we used the CATV system, the return would be lower for game producers. That's why we didn't choose cable. We want to use Satellaview as a means of advertising, not a way of selling games.

Edge Who comprises your target audience for Satellaview?

HI Children and, of course, gamesplayers. We intend to broadcast game previews between 4pm and 7pm. But Satellaview will also be a data service. We want to see shopping centres, insurance services, news… We won't show the latest games, but we are looking into the possibility of

downloading a part of the game within the limits of the cartridge size – around eight megabits. It would be a kind of preview.

Edge Are you going to market Satellaview outside Japan?

HI It's still a long way off, but if Satellaview proves to be a success in Japan we would like to introduce it abroad. It would be possible to cover America, and it would be also easy to cover Asia or China. In countries like that, cable isn't an easy solution because of the distance.

Edge How many units do you believe you can sell?

HI Around two million in the first year. Broadcasting will begin in April and the test will be done in March. We bought into the St Giga satellite around two years ago – we have around 20 per cent of the shares – and will begin to use it this year.

Edge How much did St Giga cost Nintendo?

HI The capital was ¥4 billion [£30 million], and our 20 per cent stake cost around ¥900 million [£6.8 million].

Edge Are any other companies participating in the project?

HI It's a little bit early to say, but I think companies like Hudson, Square and Enix will be involved. We've already conducted a test in cooperation with Square.

Edge Do you have any plans for Satellaview accessories?

HI Yes, we would like to release a memory cartridge to save downloaded preferences or tips. We're thinking seriously about this.

Edge On a more general subject, what kind of future do you think the games market has?

HI Despite the Japanese economic crisis, business looks very buoyant. We need to release more and more excellent software. Of course, we're also going to release new hardware, like Virtual Boy and the Ultra 64, but good software is still essential. At the moment, companies like Sony, Hitachi and Panasonic are trying to break into the games market, despite the economic crisis, and that shows just how vibrant it is.

Edge What about the games themselves? How do you see them developing.

HI Well, I can tell you that I don't think CD-ROM is the future. The main advantage of CD-ROM is its storage capacity. It's a nonsense to assume that a game will be good just because you can store interactive worlds or use real characters. Innovative worlds can be stored on only 100 megabits. In the future we would like to see gameworlds being created not just by programmers. The player should be able to determine his own setting and participate in the world creation. It will be more than interactive! EDGE





Send your **questions** to Q&A, **Edge**, 30 Monmouth Street, Bath, Avon BA1 2BW

Q **1.** How will the LaserDisc player be incorporated into Pioneer's *Mac OS* system? Will it be able to be externally connected, or can the discs only be viewed on the monitor?
2. And how much do you reckon it will cost (ballpark)?
3. Will the Video CD add-on for the 3DO ever see the light of day here given the recent emergence of the DVD specs?

Alex Ward, Stoke-on-Trent

A **1.** The Pioneer CLD machine is a high-quality quad-speed player that is already available in Japan as a standalone unit, so it will be possible to play LaserDiscs through a normal TV as well as the Pioneer Mac's monitor. It seems that the CLD player will be made available as an optional extra or built into the system.
2. Don't expect to see the system hit these shores for some time, if at all – Pioneer's *Mac OS*-based machine is currently only planned for release across Asia.
3. There are no firm plans to release the Video CD (MPEG1) cartridge for the 3DO – because of the confusion surrounding the proposed HDCD standards, Panasonic has chosen to sit on the fence until a clearer picture of the future emerges.

Q **1.** I currently own a Neo-Geo CD and was interested in converting it to a full-blown arcade system. This will mean mounting it in the back of an arcade cabinet with a stereo monitor and Neo-



Pioneer's Mac and LaserDisc combo (see Alex Ward's letter)

compatible joysticks. Is this possible, and if so, do you know of a suitable contact/supplier?
2. How will the PlayStation's software encryption work? It seems unlikely to be an operator speed difference as with the Jap/US vs UK SNES. Will this mean non-compatibility between Japanese and US software as well? What do you think are the chances of skirting this encryption via a thirdparty device such as the Datel Action Replay?
3. Will we see delays in translation from Japan to US and then to the UK, particularly with genres such as RPGs, as with the SNES? Or will we see global releases for many titles? If the former is the case, then for someone who doesn't mind paying import prices, a US machine with the advantage of early release schedules combined with English-language software would seem to be the best buy.

Nicholas Boulton, Newcastle-under-Lyme

A **1.** The cartridge-based version of the Neo-Geo has already proved to be a popular arcade machine, so a CD version (with its long loading times) is unlikely to appear. Still, it would certainly be possible to hook the machine up to an arcade monitor via SCART. Try and get hold of a copy of coin-op trade journal *Coin Slot International* (0161-624 3687) for phone numbers of arcade hardware suppliers.
2. The program in the kernel ROM of the US and European production PlayStation will boot the machine and read and check the system area of the CD. If it finds that the licence information is incorrect, it will not boot the CD. This check is in addition to the PlayStation CD security system, which is one of Sony's most closely guarded secrets. Until the UK machine arrives, it's impossible to say whether a thirdparty device (such as a cartridge that plugs into a memory card port) will be able to bypass the PlayStation's territory encryption.
3. Games developed primarily for the Japanese market will always take longer to make it to the UK – for example, RPGs packed with Japanese text have to be translated into English first, which naturally takes time. However, the delays associated with cartridge releases in the West should be reduced now that CDs are becoming the norm.

Q **1.** Is the fact that large blocks of scenery update late in Saturn *Daytona* due to a lack of VRAM – like the coin-op version – or lack of processing power?
2. Are the SNES's 2D abilities superior to those of the 3DO? If not, how is the SNES able to handle more layers of parallax than the 3DO in *SSFII*?
3. Finally, could the Saturn or PlayStation handle a perfect version of Namco's *Galaxians*[3]?

Eugene Odeluga, London

A **1.** The problem is the number of polygons the Saturn can display at once (the textures needed for these parts of the scenery are already in VRAM, as in-game transfer would be much too slow). When programmers work out more efficient methods of using the Saturn's 3D (such as AM2's new graphics library), this effect should be minimised.
2. Ironically, the SNES's 2D abilities are considerably more advanced than the 3DO's. Instead of multiple playfields as in the SNES (which has three for parallax scrolling), the 3DO uses two animation cells which can handle various effects including rotation, scaling and distortion. With good programming it's possible to generate smooth (ie 60fps) sprite movement, but matching that with fast, smooth scrolling is always troublesome.
3. No, because the *Galaxians*[3] coin-op's backgrounds are pulled off LaserDisc.

Q **1.** I will soon be replacing my Amiga with a PC. How will I go about transferring artwork I have done in *D-Paint 2.3* to the PC? Are there any PC paint packages you can recommend?
2. Are there any companies that will print my pictures for me, as my printer isn't up to the job and buying a new one isn't an option?

Anon

A **1.** You can either use a utility called *Transition* (it was on *Amiga Format* 74's coverdisk) to convert the IFFs to a common PC image format (such as TIFF), or buy the PC version of *DPaint*, which will handle most Amiga *DPaint* files.
2. As long as the image is saved in a standard file format (TIFF or JPEG, for example), you should be able to find someone to print it. Check the small ads in PC magazines.

Q and A

You can depend on Edge to cut through the technobabble and give you straight answers. You can write to us at Q&A, Edge, 30 Monmouth Street, Bath, Avon BA1 2BW. Alternatively, fax us on 01225 338236, or e-mail us at edge@futurenet.co.uk.

Edge regrets that it can't answer questions personally, by phone, post or e-mail.

next **month**



The games industry is undergoing a skills crisis. As increasing numbers of developers are seduced by the ambitions and financial resources of big-bucks entertainment companies, more and more money is pouring into development. However, with sights now being set higher than ever, demand is outstripping supply. **Edge** looks at the current trends in the interactive entertainment job market and suggests how budding designers, artists, programmers and musicians can get a foothold in it

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